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ABSTRACT

This curriculum guide in forestry is one of 10 guides developed as part of a vocational project stressing agribusiness, natural resources, and environmental protection. The scope of this guide includes six occupational subgroups: forest establishment, forest protection, logging (harvesting and transporting), wood utilization Christmas tree production, and other forestry. It is meant as an aid to all who are involved in the curriculum planning phases prior to classroom instruction. Each unit has seven elements to be used for developing specific curriculum and curriculum materials: unit concept, student performance objectives, instructional areas, examples of learning activities, examples of evaluation processes, instructional materials or equipment, and references. Appendixes list recommended materials and equipment, additional references, and selected professional and technical societies. (Author/JC)

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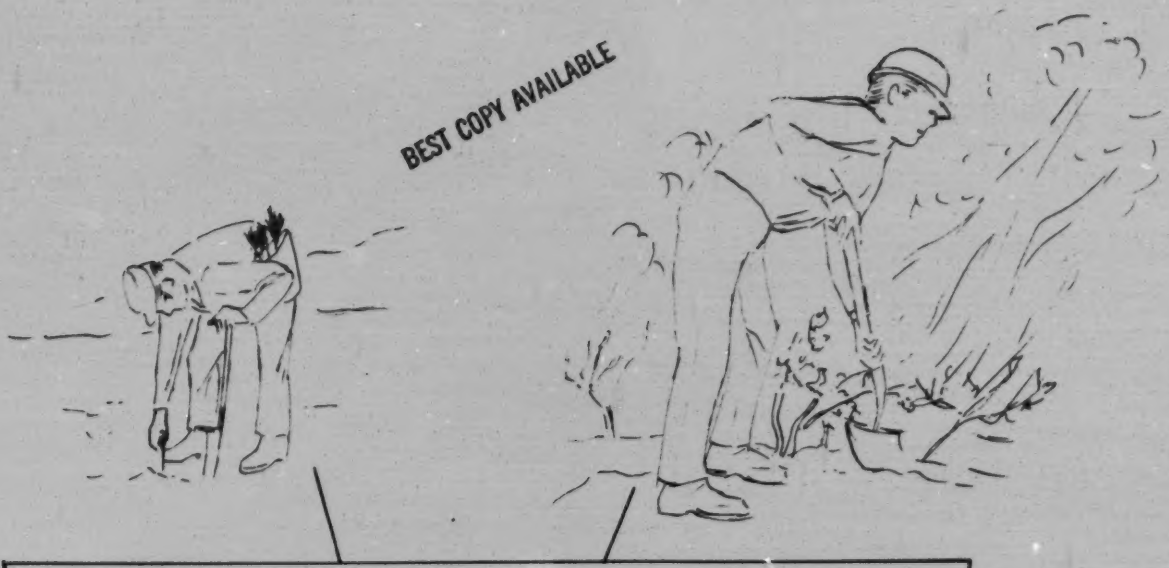
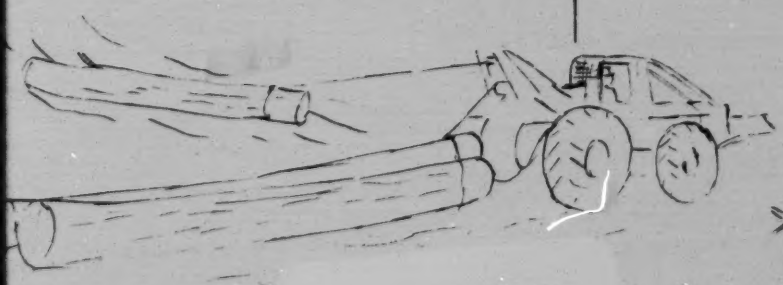


Career Preparation in

FORESTRY

A Curriculum Guide

for High School Vocational Agriculture



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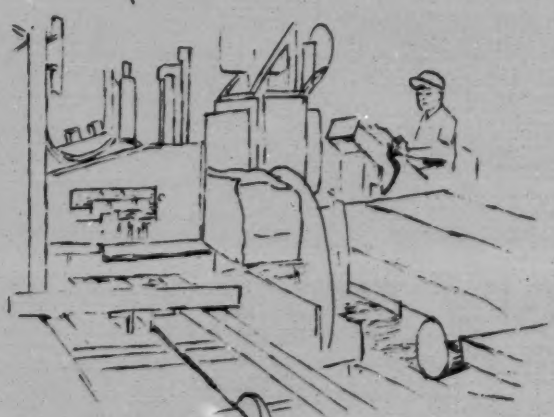

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FOREWORD

THIS SUGGESTED CURRICULUM GUIDE IN FORESTRY IS ONE OF TEN GUIDES DEVELOPED UNDER THE DIRECTION OF THE OHIO CAREER EDUCATION AND CURRICULUM MANAGEMENT LABORATORY, DEPARTMENT OF AGRICULTURAL EDUCATION, COLLEGE OF AGRICULTURE, THE OHIO STATE UNIVERSITY, AS A PART OF THE PROJECT ENTITLED, "CURRICULUM DEVELOPMENT BASIC TO THE TRAINING OF INDIVIDUALS FOR EMPLOYMENT IN AGRIBUSINESS, NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION." THE PROJECT WAS FUNDED UNDER A CONTRACT WITH THE BUREAU OF OCCUPATIONAL AND ADULT EDUCATION, U.S. OFFICE OF EDUCATION.

THE PROJECT GREW OUT OF THE NEED TO IDENTIFY THE EDUCATIONAL EXPERIENCES MOST APPROPRIATE FOR CAREER DEVELOPMENT IN AGRIBUSINESS, NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION. EDUCATORS WERE LACKING ADEQUATE AND ACCURATE INFORMATION FOR THE CAREER AWARENESS AND EXPLORATION STAGES OF THE CAREER DEVELOPMENT PROCESS CONCERNING THE AGRIBUSINESS COMPLEX. THE AGRIBUSINESS COMPLEX ALSO HAD SEVERAL EMERGING PROGRAM AREAS WHERE OCCUPATIONAL COMPETENCIES AND THE RELATED CURRICULUM HAD NOT BEEN WELL DEFINED AT THE VOCATIONAL PREPARATION LEVEL. THESE CONDITIONS CAUSED APPROPRIATE CAREER DEVELOPMENT PROGRAMS TO BE LACKING OR INEFFECTIVE AT ALL LEVELS INCLUDING VOCATIONAL EDUCATION.

IN MAY OF 1971, AGRICULTURAL LEADERS REPRESENTING STATE SUPERVISORS, TEACHER EDUCATORS, CLASSROOM TEACHERS AND THE AGRICULTURAL BUSINESS AND INDUSTRIAL COMMUNITY MET IN DENVER, COLORADO, TO DISCUSS THE CHANGING NATURE OF THE FIELD. THERE WAS GENERAL AGREEMENT THAT THE DEVELOPING EMPHASIS ON AGRIBUSINESS, NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CALLED FOR MAJOR CURRICULUM CHANGES AND DEVELOPMENT OF NEW CURRICULA WITH CHANGES IN THE PREPARATION OF AGRICULTURAL EDUCATION PERSONNEL AT THE SAME TIME.

THE PURPOSES OF THIS PROJECT WERE: (2) TO DEVELOP APPROPRIATE CURRICULUM GUIDES IN AGRIBUSINESS, NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION WHICH PROVIDE A COORDINATED EDUCATIONAL PROGRAM INCLUDING CAREER AWARENESS, CAREER EXPLORATION AND PREPARATION FOR A CLUSTER OF OCCUPATIONS; (2) TO ACQUAINT EDUCATIONAL LEADERSHIP IN ALL STATES WITH THE CURRICULUM MATERIALS FROM THIS PROJECT AND PROMOTE THEIR USE; AND (3) TO DISSEMINATE COPIES OF THE CURRICULUM MATERIALS TO LEADERS OF EACH STATE.

ACKNOWLEDGEMENTS

THIS CURRICULUM GUIDE WAS DEVELOPED BY LARRY HOUSEHOLDER AND EDDIE A. MOORE, CURRICULUM SPECIALIST ASSOCIATES, DEPARTMENT OF AGRICULTURAL EDUCATION, THE OHIO STATE UNIVERSITY, WITH THE FINAL WRITING COMPLETED BY LARRY HOUSEHOLDER. APPRECIATION IS EXTENDED TO THE STAFF OF THE OHIO CAREER EDUCATION AND CURRICULUM MANAGEMENT LABORATORY IN AGRICULTURAL EDUCATION AND THE PROJECT ADVISORY COMMITTEES FOR THEIR ASSISTANCE. APPRECIATION IS EXPRESSED TO DR. ELIZABETH J. SIMPSON, BRANCH CHIEF, CURRICULUM DEVELOPMENT BRANCH, DIVISION OF RESEARCH AND DEMONSTRATION, BUREAU OF OCCUPATIONAL AND ADULT EDUCATION, AND TO THE LATE DR. PHILLIP TESKE, PROJECT OFFICER, U.S. OFFICE OF EDUCATION, BUREAU OF OCCUPATIONAL AND ADULT EDUCATION, FOR THEIR DIRECTION DURING THE PREPARATION OF THIS GUIDE. GRATITUDE IS ALSO EXTENDED TO THE TEACHERS AND INDUSTRY PERSONNEL WHO HAVE GIVEN TIME FROM THEIR JOBS TO ASSIST IN A CRITIQUE OF THE GUIDES.

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FORESTRY

The Use of This Curriculum Guide

THERE IS LESS THAN FULL AGREEMENT ON JUST WHAT CONSTITUTES A PARTICULAR TYPE OF CURRICULUM DOCUMENT. THE CURRICULUM GUIDE IS NO EXCEPTION. THE FOLLOWING IS NOT MEANT AS AN EFFORT TO DEBATE CURRICULUM TERMINOLOGY FURTHER, BUT RATHER TO CLARIFY HOW THIS DOCUMENT CAN BE USED MORE EFFECTIVELY FOR ITS INTENDED PURPOSE.

ENTITLED A CURRICULUM GUIDE, IT IS DESIGNED TO ANSWER THE MORE BASIC QUESTIONS OF CURRICULUM PLANNING AND DEVELOPMENT - WHAT SHOULD BE TAUGHT AND, TO SOME DEGREE, HOW AND WITH WHAT RESOURCES. IT IS NOT INTENDED TO BE TAUGHT FROM NOR TO BE USED AS INSTRUCTIONAL MATERIAL IN THE CLASSROOM BY EITHER TEACHER OR STUDENTS.

IT IS MEANT AS AN AID TO ALL WHO ARE INVOLVED IN THE CURRICULUM PLANNING PHASES PRIOR TO CLASSROOM INSTRUCTION. FOR ADMINISTRATORS AND OTHERS WHO MUST MAKE DECISIONS CONCERNING FACILITIES OR EQUIPMENT, SPECIFICATIONS FOR FACILITIES AND A RECOMMENDED EQUIPMENT LIST ARE INCLUDED. FOR GUIDANCE COUNSELORS OR OTHERS WORKING WITH STUDENTS ON CAREER DECISIONS, INFORMATION IS PROVIDED CONCERNING OCCUPATIONS AND THE TYPES OF COMPETENCIES AND CHARACTERISTICS NEEDED BY THE WORKERS FOR THESE OCCUPATIONS. FOR THE CURRICULUM SPECIALIST, TEACHER EDUCATOR, STATE SUPERVISOR OR OTHERS RESPONSIBLE FOR DETERMINING INSTRUCTIONAL CONTENT AND PREPARING TEACHERS TO CONDUCT INSTRUCTIONAL PROGRAMS, THE GUIDE DEFINES THE NEEDS OF THE STUDENTS IN TERMS OF TERMINAL PERFORMANCES. ALL OTHER ASPECTS OF CURRICULUM CONTENT, TEACHING PROCESSES AND INSTRUCTIONAL RESOURCES ARE BASED UPON THE TERMINAL PERFORMANCE OBJECTIVES FOR THE STUDENTS.

THE SCOPE OF THE GUIDE INCLUDES SIX OCCUPATIONAL SUBGROUPS WITHIN THE FORESTRY AREA. THESE ARE CONSISTENT WITH AND CODED AS DEFINED IN THE STANDARD TERMINOLOGY FOR CURRICULUM AND INSTRUCTION IN LOCAL AND STATE SCHOOL SYSTEMS. THE OVERALL AREA OF FORESTRY IS GIVEN THE DESIGNATION 01.07 00 00 00. THE OCCUPATIONAL SUBGROUPS HAVE THE FOLLOWING DESIGNATIONS:

FOREST ESTABLISHMENT	01.07 01 00 00
FOREST PROTECTION	01.07 02 00 00
LOGGING - HARVESTING AND TRANSPORTING	01.07 03 00 00
WOOD UTILIZATION	01.07 04 00 00
CHRISTMAS TREES	01.07 06 01 00
OTHER FORESTRY	01.07 99 00 00

THE OCCUPATIONS CONSIDERED IN THESE SIX SUBGROUPS ARE LIMITED TO THOSE ON THE CAREER LADDER FOR WHICH HIGH SCHOOL VOCATIONAL INSTRUCTION IS EITHER NECESSARY OR SIGNIFICANTLY DESIRABLE. THE UNITS WITHIN THE GUIDES ARE BUILT UPON MINIMUM LEVELS OF COMPETENCIES FOR ENTRY LEVEL JOBS. HOWEVER, IT IS ASSUMED THAT, EVEN THOUGH STUDENTS MUST BEGIN AT THIS ENTRY LEVEL JOB, MANY WILL SOON BE STRIVING TO ADVANCE. WHENEVER THE EMPLOYEE IS PRESENTED WITH OTHER DESIRABLE JOB OPPORTUNITIES, IT IS INTENDED THAT HIS VOCATIONAL INSTRUCTION WILL HELP HIM MASTER EARLY JOB OPPORTUNITY ADVANCES IN AN EFFICIENT MANNER.

SOME STATES HAVE PROVIDED THAT APPROXIMATELY 2,000 HOURS BE USED DURING THE JUNIOR AND SENIOR YEARS FOR INSTRUCTION, LABORATORY AND COOPERATIVE ON-THE-JOB EXPERIENCE IN A SPECIALIZED FORESTRY PROGRAM. WHILE THIS GUIDE MAY NOT COVER ALL POSSIBLE INSTRUCTIONAL SEQUENCES, THERE IS LIKELY TO BE MORE INCLUDED IN THIS GUIDE THAN WOULD BE USED IN ANY ONE PROGRAM INVOLVING 2,000 HOURS. IT IS INTENDED THAT THE USERS OF THIS GUIDE WILL SELECT THOSE INSTRUCTIONAL AREAS TO BUILD AN INSTRUCTIONAL PACKAGE WHICH MOST APPROPRIATELY MEET THE STUDENTS' NEEDS IN THAT STATE OR LOCALITY.

BECAUSE MANY FORESTRY PROGRAMS ACROSS THE COUNTRY ARE SIMILAR OR, AT LEAST, HAVE MANY COMMON AREAS IN THE CURRICULUM, CONSIDERABLE REDUNDANCY OF EFFORT OCCURS AS THESE PROGRAMS ARE PLANNED AND DEVELOPED. IN PREPARING THIS GUIDE, A MAJOR CONCERN HAS BEEN TO IDENTIFY THOSE PERFORMANCE OBJECTIVES WHICH ARE COMMON TO ALL OR TO A LARGE PROPORTION OF THE PROGRAMS. THOSE WHICH ARE ONLY APPROPRIATE TO LIMITED LOCALITIES HAVE NOT BEEN INCLUDED.

IT IS INTENDED THAT THE OBJECTIVES STATED IN THIS GUIDE WOULD SAVE TIME AND EFFORT FOR STATE PERSONNEL WHO HAVE THE RESPONSIBILITY FOR DEFINING THE OCCUPATIONAL COMPETENCIES IN FORESTRY.

ONCE THE OBJECTIVES FROM THE GUIDE WHICH ARE COMMON TO THE STATE CURRICULUM NEEDS ARE DEFINED, THEY COULD BE USED TO FACILITATE STATING MORE SPECIFIC LEVELS OF OBJECTIVES. OR, IF OTHER OBJECTIVES ARE MORE APPROPRIATE, THEY COULD BE SUBSTITUTED FOR THOSE PRESENTED AS STATE OR LOCAL CONDITIONS WARRANTED.

Organization of Instructional Units

THIS CURRICULUM GUIDE IS COMPOSED OF UNITS OF INSTRUCTION. EACH UNIT IS DEVELOPED AROUND A CLOSELY-RELATED GROUP OF PERFORMANCE OBJECTIVES WHICH ARE BASIC TO THE TRAINING OF INDIVIDUALS FOR ENTRY LEVEL SKILLED EMPLOYMENT IN FORESTRY OCCUPATIONS. THE UNITS ARE ORGANIZED INTO THE FOLLOWING FORESTRY AREAS: FOREST ESTABLISHMENT, FOREST PROTECTION, LOGGING (HARVESTING AND

TRANSPORTING), WOOD UTILIZATION, CHRISTMAS TREES AND OTHER FORESTRY.

THE INSTRUCTIONAL UNITS ARE BASED UPON THE COMPETENCIES OF ENTRY LEVEL SKILLED OCCUPATIONS IN FORESTRY. MOST OF THE PERFORMANCE OBJECTIVES FOR THE UNITS ARE COMMON TO FORESTRY PROGRAMS.

Format of the Units of Instruction

EACH OF THE UNITS OF INSTRUCTION HAS SEVEN ELEMENTS TO BE USED FOR DEVELOPING SPECIFIC CURRICULUM AND CURRICULUM MATERIALS. THE LIST OF ELEMENTS INCLUDES:

1. UNIT CONCEPT
2. STUDENT PERFORMANCE OBJECTIVES
3. INSTRUCTIONAL AREAS
4. EXAMPLES OF STUDENT LEARNING ACTIVITIES
5. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCES
6. INSTRUCTIONAL MATERIALS OR EQUIPMENT
7. EXAMPLES OF SUPPORTING REFERENCES

A DESCRIPTION OF THE SEVEN ELEMENTS OF THE UNITS OF INSTRUCTION

UNIT CONCEPT

THE UNIT CONCEPT DEFINES THE RATIONALE FOR THE AREA COVERED BY THE INSTRUCTIONAL UNIT.

STUDENT PERFORMANCE OBJECTIVES

THE STUDENT PERFORMANCE OBJECTIVES HAVE BEEN CONSIDERED THE BASIC ELEMENT OF THE UNITS OF INSTRUCTION. ALL OTHER ELEMENTS ARE DEVELOPED FROM THE PERFORMANCE OBJECTIVES. THE OBJECTIVES ARE STATED IN STUDENT TERMS AT A TERMINAL PERFORMANCE LEVEL. THE TERMINAL PERFORMANCE HAVE BEEN DEFINED FROM AN ANALYSIS OF COMPETENCIES NECESSARY FOR SUCCESSFUL PERFORMANCE IN THE ENTRY LEVEL SKILLED OCCUPATIONS OF FORESTRY.

THE PERFORMANCE OBJECTIVES OF THE GUIDE ARE INTENDED TO AID CURRICULUM SPECIALISTS AND TEACHERS OF LOCAL FORESTRY PROGRAMS IN DEFINING THE COMPETENCIES WHICH CAN AND SHOULD BE ACQUIRED BY STUDENTS IN LOCAL PROGRAMS.

IT WAS FELT THAT COMPETENT TEACHERS OF A VOCATIONAL PROGRAM WOULD BE IN THE BEST POSITION TO ESTABLISH "HOW WELL" THE OBJECTIVE SHOULD BE PERFORMED, AND THE CONDITIONS UNDER WHICH IT SHOULD BE PERFORMED. HOWEVER, CONDITIONS AND STANDARDS HAVE BEEN INDICATED FOR MOST OBJECTIVES. THE INTENT IS TO DIRECT ATTENTION TO THOSE CONDITIONS WHICH MAY SIGNIFICANTLY AFFECT ACHIEVING THE PERFORMANCE AND IDENTIFY STANDARDS WHICH MAY BE ESPECIALLY IMPORTANT TO SUCCESS IN THE INDUSTRY.

INSTRUCTIONAL AREAS

THE PERFORMANCE OBJECTIVES ARE DESCRIPTIONS OF INTENDED OUTCOMES WHICH REQUIRE THE ACQUISITION OF CERTAIN KNOWLEDGE AND SKILLS. TITLES AND SUBTITLES OF INSTRUCTIONAL AREAS ARE USED TO DEFINE THE RELEVANT CONTENT.

THE TITLES ARE PRESENTED IN AN ACTION FORM AS FAR AS IS FEASIBLE TO HELP DEFINE THE SPECIFIC TYPE OF LEARNING EXPECTED TO ACHIEVE THE OBJECTIVES. THAT IS, IN DEFINING STUDY AREAS CONCERNING FELLING TREES, RATHER THAN LIMITING THE TITLE BY USING ONLY "FELLING TREES," THE SUBSTUDY AREAS OF "MAKING THE UNDERCUT" AND "BACKCUTTING" ARE USED.

BECAUSE OF THE SPECIFIC NATURE OF MUCH OF THE LEARNING MATERIALS NEEDED FOR THESE INSTRUCTIONAL AREAS, REFERENCES ARE CITED WHICH WOULD BE APPROPRIATE FOR CURRICULUM DEVELOPERS. THE TITLES FOR THE INSTRUCTIONAL AREAS ARE OF A RELATIVELY PERMANENT NATURE AND COMMON TO MOST PROGRAMS. THE SPECIFIC CONTENT TO SUPPORT THEM IS MUCH MORE ADVERSELY AFFECTED BY CHANGES IN TECHNOLOGY, GEOGRAPHICAL DIFFERENCES OR DIFFERENCES IN LOCAL OCCUPATIONAL CHARACTERISTICS.

IT MAY BE POSSIBLE TO USE THE SUGGESTED TITLES OVER A PERIOD OF TIME WITH RELATIVELY MINOR ADJUSTMENTS. SPECIFIC CONTENT, ON THE OTHER HAND, NEEDS TO BE CONTINUALLY UPDATED TO CURRENT CONDITIONS AND MATCHED WITH LOCAL STUDENT NEEDS AND OCCUPATIONAL CHARACTERISTICS.

THE NUMBERS OF THE INSTRUCTIONAL AREA TITLES ARE NOT MATCHED TO THE NUMBERS OF THE STUDENT PERFORMANCE OBJECTIVES. HOWEVER, INSTRUCTIONAL AREAS RELATING TO AN OBJECTIVE CAN BE DETERMINED RELATIVELY EASILY. THE INSTRUCTIONAL AREAS ARE SEQUENCED AS MUCH AS IS FEASIBLE IN THE SAME ORDER AS THE PERFORMANCE OBJECTIVES TO WHICH THEY RELATE.

EXAMPLES OF STUDENT LEARNING ACTIVITIES

EXAMPLES ARE PROVIDED SUGGESTING WAYS IN WHICH STUDENTS MAY BE ACTIVELY INVOLVED IN LEARNING ACTIVITIES THAT WOULD HELP THEM ACHIEVE THE OBJECTIVES. THEY ARE OFFERED AS ONE APPROACH THAT MAY BE USED RATHER THAN INTENDED TO BE THE COMPLETE LIST OF ACTIVITIES WHICH WOULD PROVIDE THE MOST EFFECTIVE LEARNING. THE SUGGESTED ACTIVITIES FOR EACH OBJECTIVE MAY OR MAY NOT COVER THE ENTIRE OBJECTIVE. THEREFORE, DEVELOPMENT OF OTHER ACTIVITIES FOR THE LOCAL PROGRAM WILL BE NECESSARY FOR A COMPREHENSIVE PROGRAM.

THERE IS AT LEAST ONE ACTIVITY FOR EACH STUDENT PERFORMANCE OBJECTIVE. THE NUMBER ON THE ACTIVITY IS THE SAME AS THE STUDENT PERFORMANCE OBJECTIVE TO WHICH IT IS RELATED.

EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

THE STUDENT EVALUATION SHOULD BE DIRECTED TOWARD AND BASED UPON WELL-WRITTEN STUDENT PERFORMANCE OBJECTIVES. IN THIS GUIDE, THE STUDENT PERFORMANCE OBJECTIVES ARE INTENDED TO BE EXPLICITLY STATED IN WHAT TERMINAL PERFORMANCE THE STUDENT IS TO BE ABLE TO DO AND, TO SOME DEGREE, HOW WELL AND UNDER WHAT CONDITIONS. PRIMARILY, THE EVALUATION IS TO USE THE STATED OBJECTIVES AS A REFERENCE POINT TO ANSWER THE QUESTION - CAN THE STUDENT ACHIEVE THE DESIRED PERFORMANCE LEVEL.

IN ADDITION, AN ELEMENT DESIGNATED AS "EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE" IS INCLUDED IN EACH UNIT OF INSTRUCTION. EXAMPLES OF EVALUATION PROCESSES ARE INTENDED TO ASSIST IN DETERMINING THE LEVEL OF UNDERSTANDING OR THE ABILITY OF THE STUDENT TO ACCOMPLISH PARTS OF OR THE ENTIRE PERFORMANCE OBJECTIVE. THESE PROCESSES ARE NOT INTENDED TO REPLACE A DIRECT EVALUATION OF THE TERMINAL PERFORMANCE AS STATED IN THE OBJECTIVE.

THE TYPE OF EVALUATION PROCESS IS DETERMINED IN PART BY THE NATURE OF THE PERFORMANCE OBJECTIVES. BUT THE MOST DESIRABLE METHOD CAN BE BEST DETERMINED WHEN THERE IS KNOWLEDGE OF THE LOCAL SITUATION, SUCH AS, EDUCATIONAL RESOURCES, SCHOOL POLICIES AND THE NEEDS OF THE STUDENTS.

THERE IS AT LEAST ONE EVALUATION PROCESS FOR EACH STUDENT PERFORMANCE OBJECTIVE. THE NUMBER ON THE EVALUATION ACTIVITY IS THE SAME AS THE STUDENT PERFORMANCE OBJECTIVE TO WHICH IT IS RELATED.

INSTRUCTIONAL MATERIALS OR EQUIPMENT

MATERIALS OR EQUIPMENT ARE NOTED WHICH ARE SPECIFIC TO THE UNIT AND WHICH ARE CONSIDERED ESSENTIAL OR QUITE DESIRABLE IN

THE LEARNING PROCESS. IN SOME CASES, THE OBJECTIVES WOULD BE QUITE DIFFICULT TO ACHIEVE, IF AT ALL, WITHOUT THE MATERIALS. IN OTHERS, THE MATERIALS OR EQUIPMENT AID IN THE EFFECTIVENESS OR EFFICIENCY OF LEARNING.

THE MATERIALS AND EQUIPMENT SUGGESTED FOR ONE UNIT ARE NOT NECESSARILY CONSUMED OR UNIQUE JUST TO THE LEARNING ACTIVITIES OF THAT UNIT. A LIST OF THE EQUIPMENT SUGGESTED FOR A COMPREHENSIVE FORESTRY PROGRAM IS LISTED IN APPENDIX A.

EXAMPLES OF SUPPORTING REFERENCES

A LIMITED NUMBER OF REFERENCES HAS BEEN LISTED WHICH DIRECTLY RELATES TO THE CURRICULUM STUDY AREAS SUGGESTED IN THE "INSTRUCTIONAL AREAS" SECTION. THESE REFERENCES ARE AVAILABLE AND THE SOURCES OR DETAILS OF SECURING THEM ARE LOCATED IN APPENDIX B OF THIS GUIDE.

WHEN TWO OR MORE REFERENCES ARE FOUND TO HAVE ADEQUATE LEARNING MATERIALS AND PROCESSES FOR THE OBJECTIVES OF A UNIT BUT HAVE UNIQUELY DIFFERENT STYLES, THE GROUP MAY BE LISTED SO THAT THE TEACHER HAS THE CHOICE OF SELECTING THE ONE MOST SUITED TO HIS TEACHING.

IN SOME CASES, SEVERAL REFERENCES ARE NOTED BECAUSE NO ONE REFERENCE ADEQUATELY COVERS ALL OF THE OBJECTIVES OF A UNIT OR STUDY AREA. ANNOTATIONS OF THE REFERENCES ARE PROVIDED TO AID IN DETERMINING WHICH REFERENCE OR REFERENCES WOULD BE BEST SUITED FOR A LOCAL PROGRAM. THE REFERENCE SUGGESTED FOR ONE UNIT IS OFTEN RELEVANT TO AND SUGGESTED FOR USE IN SEVERAL OF THE UNITS. IN NO WAY SHOULD THE REFERENCES BE CONSIDERED THE BEST OR ONLY REFERENCES TO BE USED WITH THE UNITS.

Recommended Facilities and Equipment

SUGGESTIONS FOR PLANNING THE FACILITIES FOR FORESTRY PROGRAMS

THE NATURE AND THE EXTENT OF THE FACILITIES NEEDED FOR FORESTRY INSTRUCTION WILL BE INFLUENCED BY THE PROJECTED ENROLLMENTS, THE PLANNED USE OF THE FACILITIES BY CONTINUING EDUCATION AND OTHER GROUPS, AND THE AREAS OF EMPHASIS TO BE INCLUDED IN THE COURSE OF STUDY. THE SUGGESTIONS WHICH FOLLOW ARE TO BE CONSIDERED ONLY AS GUIDES FOR SCHOOL FACILITY PLANNERS AND ARCHITECTS.

SPACE ALLOCATIONS

RECOMMENDED MINIMUM SPACE ALLOCATIONS FOR ACCOMMODATING A FORESTRY PROGRAM INCLUDE:

CLASSROOM - 720 SQUARE FEET
OFFICE AND CONFERENCE ROOM - 200 SQUARE FEET PER TEACHER
INDOOR LABORATORY - 3,000 SQUARE FEET
OUTSIDE PAVED AND FENCED STORAGE AREA - 1,200 SQUARE FEET
FOREST LAND MANAGEMENT AREA - 200 - 500 ACRES

CLASSROOM

THE CLASSROOM SHOULD BE EQUIPPED WITH TABLES AND CHAIRS TO ACCOMMODATE THE ANTICIPATED NUMBER OF STUDENTS; A TACK BOARD; A CHALK BOARD; A TEACHER'S WORK BENCH WITH SINK, RUNNING WATER, GAS, AIR AND ELECTRICAL OUTLETS; SHELF SPACE; STORAGE SPACE; AND FILING CABINETS.

CONSIDERATION SHOULD BE GIVEN TO PROVIDING SOME COMBINATION STUDENT TABLES WITH EITHER FULL OR PARTIAL TILTING TOP WHICH WOULD PROVE USEFUL IN PHASES OF THE INSTRUCTIONAL PROGRAM REQUIRING DRAWING OR MAP WORK.

INDOOR MECHANICS LABORATORY

SUITABLE FACILITIES SHOULD BE PROVIDED SO THAT STUDENTS WILL HAVE AN APPROPRIATE PLACE TO WORK ON SMALL GASOLINE ENGINES AND LARGER POWER UNITS, FOR CONSTRUCTION OF LAND LABORATORY STRUCTURES AND FACILITIES, TO MAINTAIN HAND AND POWER EQUIPMENT, AND TO PROVIDE OPPORTUNITIES FOR THE STUDENTS TO OBTAIN THE MECHANICS SKILLS NECESSARY FOR EMPLOYMENT. THE LABORATORY AREA SHOULD HAVE A CONCRETE FLOOR, AN OVERHEAD DOOR AT LEAST 16 FEET WIDE, AND ADEQUATE HEATING, VENTILATION AND LIGHTING. IT SHOULD ALSO BE PROVIDED WITH APPROPRIATE BENCHES, TOOL CABINETS AND ACCESSORIES. ACCESS TO THE FOREST LAND MANAGEMENT AREA SHOULD BE CONVENIENT.

THE FOREST LAND MANAGEMENT AREA

THE FOREST LAND MANAGEMENT AREA SHOULD PROVIDE OPPORTUNITIES FOR THE STUDENTS TO ENGAGE IN MOST FORESTRY ACTIVITIES THAT WOULD BE ENCOUNTERED IN FULL-TIME EMPLOYMENT. THE FORESTED AREA MUST BE LARGE ENOUGH AND OF ADEQUATE QUALITY TO PROVIDE IN-DEPTH EXPERIENCES FOR EACH STUDENT IN THE AREAS OF FOREST ESTABLISHMENT, FOREST SURVEYING AND MENSURATION, FOREST PROTECTION AND HARVESTING. PROGRAM PLANNERS SHOULD DETERMINE THE SIZE OF THE

FOREST AREA THAT WOULD BE UTILIZED BY THE CLASSES EACH YEAR IN ORDER TO DETERMINE THE MOST APPROPRIATE SIZE OF FOREST LAND MANAGEMENT AREA TO OBTAIN FOR THE PROGRAM. THE FOREST AREA SHOULD BE PURCHASED OR LEASED WITH THE EXPLICIT PURPOSE OF PROVIDING REALISTIC EXPERIENCES FOR THE STUDENTS. IN OBTAINING AN ADEQUATE FOREST AREA FOR THE PROGRAM, FEDERAL AND STATE FORESTRY SERVICES AS WELL AS PRIVATE FOREST INDUSTRIES SHOULD BE CONTACTED TO EXPLORE THE POSSIBILITIES OF DEVELOPING COOPERATIVE AGREEMENTS FOR USE OF FORESTS FOR THE PROGRAM.

RECOMMENDED EQUIPMENT AND SUPPLIES

THE TYPE AND QUANTITIES OF EQUIPMENT AND SUPPLIES REQUIRED TO PROVIDE EFFECTIVE OCCUPATIONAL EDUCATION IN FORESTRY WILL DEPEND UPON SEVERAL FACTORS. THESE INCLUDE: THE ANTICIPATED SIZES OF THE GROUPS TO BE SERVED; THE TYPES OF GROUPS TO BE SERVED; AND THE EMPHASIS TO BE INCLUDED IN THE COURSE OF STUDY IN TERMS OF THE DIVERSIFICATION OR SPECIALIZATION.

THE OPTIMUM CLASS SIZE IS CONSIDERED, FOR PLANNING PURPOSES, TO BE ABOUT TWENTY STUDENTS. SUFFICIENT QUANTITIES OF TOOLS, EQUIPMENT AND SUPPLIES SHOULD BE PROVIDED TO MAKE MAXIMUM USE OF THE TIME AVAILABLE FOR LABORATORY AND PRACTICAL EXERCISES. THIS WILL NOT REQUIRE NECESSARILY THAT TWENTY DUPLICATES OF A SPECIFIC ITEM WILL BE NEEDED AS PROPER MANAGEMENT OF PRACTICAL SITUATIONS WILL SELDOM RESULT IN EACH PUPIL USING THE IDENTICAL ITEM AT THE SAME TIME.

AN ADVISORY COMMITTEE COMPOSED OF REPRESENTATIVES FROM EACH OF THE OCCUPATIONAL AREAS IN THE LOCAL FOREST INDUSTRY CAN PROVIDE VALUABLE ASSISTANCE IN DEVELOPING LISTS OF NEEDED EQUIPMENT AND SUPPLIES.

A LIST OF EQUIPMENT THAT CAN BE USED AS A GUIDE IN ORDERING AND ASSEMBLING THOSE ITEMS NEEDED IS LOCATED IN APPENDIX A. MANY STATE DEPARTMENTS HAVE MORE DEFINITIVE LISTS AVAILABLE AND IT MAY BE WELL TO REQUEST THESE AS ADDITIONAL SOURCES OF INFORMATION. IN ADDITION, EXPERIENCE CAN BE AN IMPORTANT FACTOR IN DEVELOPING LISTS OF EQUIPMENT NEEDS.

TEACHER REQUIREMENTS AND RESPONSIBILITIES

THE EFFECTIVENESS OF A FORESTRY PROGRAM DEPENDS LARGELY UPON THE EXPERIENCE, EDUCATIONAL BACKGROUND AND PERSONAL QUALITIES OF THE FACULTY. INSTRUCTORS IN FORESTRY REQUIRE ADVANCED PROFESSIONAL PREPARATION IN THE AREAS THEY ARE TO TEACH. WITH FEW EXCEPTIONS, THEY SHOULD HOLD AT LEAST A BACHELOR'S DEGREE WITH MAJOR EMPHASIS IN FORESTRY AND VOCATIONAL EDUCATION. THEY

SHOULD HAVE HAD WORK EXPERIENCE IN A GOVERNMENT AGENCY OR IN A FOREST INDUSTRY. EXPERIENCE AND WILLINGNESS TO WORK WITH YOUTH ORGANIZATIONS ARE ALSO ESSENTIAL ELEMENTS OF THE TEACHER'S OCCUPATIONAL PREPARATION. FACULTY MEMBERS WITH BOTH A THEORETICAL AND PRACTICAL BACKGROUND CAN BRING TO THE PROGRAM THE ENTHUSIASM AND APPRECIATION FOR FORESTRY THAT ARE ESSENTIAL TO THE PROGRAM'S SUCCESS.

THE INSTITUTION MUST INSURE THAT ITS FACULTY WORKLOAD PERMITS TIME FOR INDIVIDUAL AND DEPARTMENTAL ACTIVITIES AS WELL AS THE SUPERVISION OF STUDENTS ON THE JOB. FACULTY MEMBERS SHOULD HAVE APPROPRIATE TRAINING AIDS AND SUPPLEMENTAL MATERIAL FOR THEIR RESPECTIVE COURSES AND A WORKING KNOWLEDGE OF WHAT OTHERS ARE TEACHING IN FORESTRY, AGRICULTURE AND RELATED COURSE CONTENT.

FACULTY MEMBERS SHOULD BE ENCOURAGED TO PARTICIPATE IN ACTIVITIES AND ORGANIZATIONS WHICH LEAD TO PERSONAL PROFESSIONAL DEVELOPMENT THROUGH OFFERING RELEASED TIME AND FINANCIAL ASSISTANCE FOR IN-SERVICE TRAINING. THE IN-SERVICE TRAINING PROGRAM SHOULD BE DEVELOPED TO STRENGTHEN INDIVIDUAL WEAKNESSES. ONE TEACHER MAY PROFIT MORE FROM SUMMER EMPLOYMENT IN INDUSTRY, WHILE ANOTHER SHOULD ATTEND FORMAL CLASSES. MAINTAINING CLOSE CONTACT WITH PRACTITIONERS AND CURRENT LITERATURE IN THE FIELD THROUGH SPECIAL INSTITUTES AND CONFERENCES SHOULD PROVIDE A BASIS FOR CONSTANT UPDATING OF MATERIAL FOR THEIR COURSES.

ADVISORY COMMITTEES

ADVISORY COMMITTEES UTILIZING COMMUNITY RESOURCE PERSONS CAN ASSIST THE SECONDARY INSTITUTION ADMINISTRATION IN PLANNING AND IMPLEMENTING FORESTRY PROGRAMS TO MEET THE OBJECTIVES OF THE INSTITUTION, THE STUDENT AND THE COMMUNITY.

THE SPECIAL ADVISORY COMMITTEE FOR THE FORESTRY PROGRAMS SHOULD INCLUDE REPRESENTATIVES OF EMPLOYERS AND PUBLIC EMPLOYMENT SERVICES, SCIENTIFIC OR TECHNICAL SOCIETIES AND ASSOCIATIONS IN THE FIELD AND KNOWLEDGEABLE CIVIC LEADERS WHO MEET WITH AND ADVISE THE SPECIALISTS ON THE SCHOOL STAFF. THE COMMITTEE NORMALLY CONSISTS OF ABOUT NINE TO TWELVE MEMBERS WHO GENERALLY SERVE FOR A ONE- TO THREE-YEAR PERIOD. THE HEAD OF THE INSTITUTION OR THE DEPARTMENT HEAD IS ORDINARILY CHAIRMAN. MEMBERS ARE APPOINTED FOR REGULAR TERMS, SUBJECT TO REAPPOINTMENT, AND MEMBERSHIP SHOULD ROTATE SO THAT SOME EXPERIENCED ADVISORS ARE PRESENT WITH SOME NEW ONES EACH TERM. IT SHOULD BE REMEMBERED THAT ADVISORY COMMITTEE PEOPLE ARE BUSY; THEREFORE, MEETINGS SHOULD BE CALLED ONLY WHEN COMMITTEE ACTION CAN BEST HANDLE A SPECIFIC TASK OR PROBLEM.

LETTERS OF APPOINTMENT SHOULD COME FROM THE CHIEF SCHOOL ADMINISTRATOR, WHILE THE COMMITTEE FUNCTIONS WITHOUT LEGAL STATUS

OR POWERS, IT CAN PROVIDE INVALUABLE ASSISTANCE TO THE INSTITUTION BY ASSISTING IN A FEASIBILITY STUDY OF PROPOSED NEW EDUCATIONAL PROGRAMS, BY PROVIDING SUPPORT TO SCHOOL ADMINISTRATORS IN OBTAINING APPROPRIATIONS AND STATE AND FEDERAL SUPPORT TO FINANCE THE PROGRAMS, BY ASSISTING IN THE LOCATION OF WORK EXPERIENCE STATIONS, BY SURVEYING AND DEFINING THE KNOWLEDGE AND SKILLS NEEDED BY FORESTRY WORKERS, AND BY ASSISTING IN THE PLACEMENT OF GRADUATES (IN JOBS).

THIS GUIDE, DESIGNED PRIMARILY FOR PLANNING AND DEVELOPMENT OF PROGRAMS IN HIGH SCHOOLS, CAN BE USED BY THE ADVISORY COMMITTEE AS A STARTING POINT, MODIFYING IT TO MEET LOCAL NEEDS. THE PROGRAM CAN ALSO FORM THE BASIS FOR COURSES TO MEET THE REQUIREMENTS OF EMPLOYED ADULTS WHO WISH TO UPGRADE OR UPDATE THEIR SKILLS AND TECHNICAL CAPABILITIES. IN THIS WAY, THE SCHOOL ADMINISTRATION, WITH THE HELP OF THE COMMITTEE AND SPECIAL CONSULTANTS, CAN EFFECTIVELY INITIATE THE NEEDED PROGRAM, QUICKLY DEVELOP IT TO A HIGH LEVEL OF EXCELLENCE, AND MAINTAIN ITS TIMELINESS.

Scientific and Technical Societies and Trade Associations

SCIENTIFIC AND TECHNICAL SOCIETIES, COMMERCIAL FIRMS AND TRADE GROUPS ARE AN IMPORTANT SOURCE OF INSTRUCTIONAL MATERIALS AND OTHER BENEFITS FOR TEACHERS AND STUDENTS. THE SOCIETIES, IN THEIR PUBLICATIONS AND AT MEETINGS, PROVIDE CONTINUAL EXPOSURE TO THE MOST RECENT DEVELOPMENTS IN THE SCIENCE AND RELATED TECHNOLOGIES AND PROBABLY SERVE AS THE BEST MEANS FOR HELPING PERSONS KEEP UP-TO-DATE IN A PARTICULAR PHASE OF THE SCIENCE.

LESS CONSPICUOUS, BUT EXTREMELY IMPORTANT, IS THE SUPPORT WHICH SOCIETIES MAY GIVE: (1) IN HELPING TO DEVELOP EVIDENCE OF THE NEED FOR THE TRAINING PROGRAM; (2) IN HELPING TO PROMOTE THE PROGRAM; (3) IN ENLISTING MEMBERS' SUPPORT FOR THE PROGRAM; (4) IN HELPING TO PROVIDE WORK EXPERIENCE FOR STUDENTS; AND (5) IN HELPING WITH THE PLACEMENT OF GRADUATES.

ASSOCIATIONS AND SOCIETIES MAY SUPPLY RESOURCE PEOPLE TO SPEAK TO CLASSES. THEY MAY ALSO SERVE AS HOSTS TO STUDENT GROUPS ON FIELD TRIPS TO STUDY SPECIFIC PHASES OF THE INDUSTRY.

THE FOLLOWING IS A SELECTED LISTING OF SOME OF THE ORGANIZATIONS AND ASSOCIATIONS WHICH ARE PERTINENT TO FORESTRY:⁂

AMERICAN CONGRESS ON SURVEYING AND MAPPING
AMERICAN FORESTRY ASSOCIATION

⁂ SEE APPENDIX C FOR A COMPLETE ADDRESS OF THESE ORGANIZATIONS AND ASSOCIATIONS

AMERICAN FOREST PRODUCTS INDUSTRIES
AMERICAN PULPWOOD ASSOCIATION
ASSOCIATION OF CONSULTING FORESTERS
FOREST FARMERS ASSOCIATION COOPERATIVE
FOREST PRODUCTS RESEARCH SOCIETY
INDUSTRIAL FORESTRY ASSOCIATION
NORTHEASTERN LOGGERS ASSOCIATION
SOCIETY OF AMERICAN FORESTERS
SOIL CONSERVATION SOCIETY OF AMERICA, INC.
SOUTHERN FOREST INSTITUTE
SOUTHERN PINE ASSOCIATION
TECHNICAL ASSOCIATION OF THE PULP AND PAPER INDUSTRY

Employment Opportunities in Forestry

A GENERALLY ACCEPTED DEFINITION OF FORESTRY IS THE SCIENCE, ART AND PRACTICE OF MANAGING AND USING FOR HUMAN BENEFIT THE NATURAL RESOURCES WHICH OCCUR ON AND IN ASSOCIATION WITH FOREST LANDS. THERE ARE TWO MAIN TYPES OF FORESTRY WORK: PROFESSIONAL AND NONPROFESSIONAL. PROFESSIONALS ARE CORRECTLY REFERRED TO AS FORESTERS WHILE NONPROFESSIONALS SHOULD BE CALLED FOREST WORKERS. PROFESSIONAL FORESTERS PLAN AND SUPERVISE THE MANAGEMENT OF FOREST AREAS AND ARE REQUIRED TO HAVE A COLLEGE DEGREE IN FORESTRY. NONPROFESSIONAL FOREST WORKERS USUALLY WORK UNDER THE GENERAL SUPERVISION OF PROFESSIONAL FORESTERS. THEY MAY INCLUDE SUCH FORESTRY TECHNICIANS AS TIMBER CRUISERS, FIRE DISPATCHERS AND LOG SCALERS; AND FORESTRY AIDES, SUCH AS, TREE NURSERY AIDES, LOOKOUTS, FIRE CONTROL ASSISTANTS, AND RECREATION GUARDS. SKILLED WORKERS IN MANY TRADES, SUCH AS, MECHANICS, ELECTRICIANS, WELDERS AND BULLDOZER OPERATORS, AS WELL AS CLERICAL WORKERS, ARE EMPLOYED IN THE FOREST INDUSTRY. THERE ARE ALSO JOBS FOR SEMI-SKILLED AND UNSKILLED LABORERS IN THE WOODS AND IN FOREST INDUSTRY PLANTS AND MILLS. IT MUST BE KEPT IN MIND THAT MUCH OF THE WORK WITH STATE AND FEDERAL FOREST SERVICES AND SOME FOREST INDUSTRY WORK IS SEASONAL IN NATURE.

TYPICAL OCCUPATIONS FOR PERSONS COMPLETING THE COURSE OUTLINED IN THIS GUIDE INCLUDE:

Entry Level Skilled Occupation:	D.O.T. No.:
FORESTER AIDE	441.384
FIRE LOOKOUT	441.168
FIRE-CONTROL AIDE	441.137
FIRE PATROLMAN	441.687
FOREST-FIRE FIGHTER	441.887

Entry Level Skilled Occupation:	D.O.T. No.:
SPRAYER	441.887
TREE PLANTER	441.887
TREE PRUNER	441.887
CRUISER	449.287
TREE CLIMBER	449.884
SEED-CONE PICKER	449.887
TIMBER MARKER	940.384
BUCKER (LOGGING)	940.884
FELLER	940.884
LIMBER	940.884
LOGGER, ALL-ROUND	940.884
LOG GRADER	941.387
LOG SCALER	941.488
BOOM MAN	941.684
LOG BRANDER (MARKER)	941.887
LOG-LOADER OPERATOR	942.883
LOGGING ROADMAN	949.887
CHOKERMAN	942.887
PEELER	942.887
SAWMILL WORKER	667.782
STICKERMAN	949.886
DRY-KILN OPERATOR	563.381
INCISING-MACHINE OPERATOR	561.782

Validation of Forestry Units

THE FORESTRY UNITS HAVE BEEN DEVELOPED THROUGH THE USE OF COMPETENCY LISTS REVIEWED BY FOREST INDUSTRY REPRESENTATIVES AND VOCATIONAL FORESTRY TEACHERS AND THE USE OF CURRICULUM GUIDES AND INSTRUCTIONAL MATERIALS ACCUMULATED FROM VARIOUS SOURCES THROUGHOUT THE UNITED STATES. THE COMPETENCY LISTS WERE REVIEWED BY INDUSTRY REPRESENTATIVES AND FORESTRY TEACHERS IN OHIO, GEORGIA, FLORIDA, TEXAS AND OREGON. THE TERMINAL OBJECTIVES CITED AT THE BEGINNING OF THE UNITS ARE BASED, TO A LARGE EXTENT, UPON THESE COMPETENCY LIST REVIEWS.

MAJOR REFERENCES USED IN DEVELOPING THE GUIDE WERE THOSE FROM VIRGINIA, PENNSYLVANIA, GEORGIA, WASHINGTON, TEXAS AND ALABAMA. THESE GUIDES AND MANUALS WERE OF GREAT VALUE IN FURTHUR DEFINING NEEDED COMPETENCIES OF ENTRY LEVEL FORESTRY WORKERS AND IN ORGANIZING THE CONTENT OF THE GUIDE.

THE UNITS IN THIS GUIDE WERE REVIEWED BY FORESTRY INSTRUCTORS IN GEORGIA AND OREGON AS WELL AS BY INDUSTRY REPRESENTATIVES IN GEORGIA. IN ADDITION, THE GUIDES WERE REVIEWED BY STATE AND NATIONAL CURRICULUM SPECIALISTS WHO ARE INVOLVED WITH

DEVELOPING CURRICULUM MATERIALS FULL TIME. THE REVIEWS FROM THESE INDIVIDUALS PROVIDED VALUABLE INPUT FOR THE REVISION AND IMPROVEMENT OF THIS GUIDE.

IT MUST ALSO BE NOTED THAT, ALTHOUGH THIS SECTION HAS CITED SOURCES OF REFERENCES USED IN DEVELOPING THE GUIDE, THIS IS BY NO MEANS AN EXHAUSTIVE LIST OF INFORMATION SOURCES. THE STATE OF THE ART IN CURRICULUM MATERIALS IN FORESTRY, AS FOUND BY THIS PROJECT, IS VERY PROMISING. MANY STATE DEPARTMENTS AND CURRICULUM LABORATORIES HAVE DEVELOPED EXCELLENT INSTRUCTIONAL AIDS, INCLUDING STUDENT MANUALS, FILM STRIP AND SLIDE SERIES, TRANSPARENCY SETS AND CURRICULUM GUIDES WHICH CAN BE USED AS SUPPLEMENTARY REFERENCE MATERIALS FOR THE UNITS IN THIS GUIDE.

THIS CURRICULUM GUIDE IN FORESTRY PROVIDES A PLAN FOR DEVELOPING PROGRAMS BASED ON MANY OF THESE VARYING INSTRUCTIONAL MATERIALS. THE GUIDE ALSO CITES REFERENCES FROM SEVERAL OF THESE SOURCES OF CURRICULUM MATERIALS. OTHER VALUABLE AIDS ARE AVAILABLE FROM THESE SOURCES WHICH WILL COMPLEMENT THE INSTRUCTIONAL PROGRAM OUTLINED IN THIS CURRICULUM GUIDE.

Legal and Safety Considerations for Forestry Programs

DUE TO THE HAZARDOUS CONDITIONS WHICH EXIST IN MANY OF THE FORESTRY ACTIVITIES OUTLINED IN THIS GUIDE, ESPECIALLY THOSE IN THE HARVESTING, TRANSPORTING AND MILLING OPERATIONS, PROGRAM PLANNERS AND DEVELOPERS SHOULD CONSIDER LEGAL AND SAFETY IMPLICATIONS BEFORE IMPLEMENTING AN INTENSIVE FORESTRY PROGRAM. THE FOLLOWING LIST OF FACTORS SHOULD PROVIDE SOME IMPORTANT GUIDELINES FOR CONSIDERATION:

(1) THE FORESTRY PROGRAM MUST HAVE STATE AND LOCAL APPROVAL AS BEING A BONIFIED VOCATIONAL PROGRAM.

(2) THE INSTRUCTOR(S) MUST HAVE STATE APPROVAL TO TEACH THE PROGRAM AND POSSESS A VALID VOCATIONAL TEACHING CERTIFICATE.

(3) THE FIELD ACTIVITIES MUST BE A PART OF THE STUDENTS' OCCUPATIONAL EXPERIENCE PROGRAMS AND NOT A COMMERCIAL FORESTRY OPERATION.

(4) THE STUDENTS ENROLLED IN THE PROGRAM MUST BE AT LEAST SIXTEEN YEARS OLD.

(5) PROPER PARENTAL OR GUARDIAN CONSENT FOR ENROLLMENT OF THE STUDENT IN THE PROGRAM SHOULD BE OBTAINED.

(6) THE STUDENT SHOULD BE ABLE TO MEET THE PHYSICAL REQUIREMENTS OF THE OCCUPATION FOR WHICH HE IS PREPARING.

(7) PROPER PROTECTION IN THE FORM OF SAFETY EQUIPMENT AND APPAREL MUST BE PROVIDED FOR THE STUDENTS AT ALL TIMES.

(8) THE PROGRAM MUST BE INSPECTED BY ALL CONCERNED REGULATORY AGENCIES WHEN REQUIRED.

(9) ALL AREAS OF DOUBT CONCERNING LEGAL AND SAFETY REGULATIONS MUST BE CLEARED UP BEFORE THE PROGRAM IS IMPLEMENTED.

I

FORESTRY

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Units General to the Forestry Areas

OCCUPATIONAL OPPORTUNITIES IN FORESTRY

HUMAN RELATIONS IN FORESTRY

DEVELOPING LEADERSHIP THROUGH FFA

OUTDOOR FIRST AID

OPERATION AND CARE OF THE CHAIN SAW

CHAIN SAW MAINTENANCE

OPERATION AND MAINTENANCE OF GASOLINE AND DIESEL POWER UNITS

READING AND INTERPRETING TOPOGRAPHICAL MAPS AND AERIAL PHOTOGRAPHS IN FORESTRY

TREE IDENTIFICATION

OCCUPATIONAL OPPORTUNITIES IN FORESTRY

UNIT CONCEPT: THE FIELD OF FORESTRY INCLUDES A BROAD SPECTRUM OF CAREER OPPORTUNITIES THE STUDENT MAY WISH TO EXPLORE. BY STUDYING THE VARIOUS OCCUPATIONS, THE STUDENT IS ABLE TO CONSIDER VARIOUS FACTORS, SUCH AS WORKING CONDITIONS, SALARY AND REQUIREMENTS FOR ENTRY, THAT WILL INFLUENCE HIS CAREER CHOICE.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. IN SEEKING INFORMATION ABOUT JOB OPPORTUNITIES, SURVEY THE INDUSTRY OR OBTAIN LITERATURE WHICH WILL ASSIST HIM IN DETERMINING THE NUMBER AND KIND OF JOB OPPORTUNITIES THAT ARE AVAILABLE IN FORESTRY.

2. WHEN GIVEN A SPECIFIC CAREER IN WHICH THE STUDENT IS INTERESTED, DETERMINE THE COMPETENCIES AND REQUIREMENTS NEEDED BY PERSONS TO ENTER AND ADVANCE IN THAT CAREER.

3. UPON DETERMINING THE REQUIREMENTS AND COMPETENCIES NEEDED TO ENTER A JOB, DEVELOP A PERSONAL PLAN WHICH WILL AID HIM IN ACQUIRING THE COMPETENCIES AND MEETING THE REQUIREMENTS NEEDED FOR ENTRY IN THAT JOB.

4. UPON IDENTIFYING A JOB IN WHICH HE IS INTERESTED, FOLLOW THE PROPER PROCEDURES NECESSARY TO BECOME PLACED ON THE JOB.

5. UPON SECURING PLACEMENT ON A JOB, WORK WITH OTHER EMPLOYEES, THE EMPLOYER AND/OR CUSTOMERS IN A MANNER THAT WILL ENABLE THE STUDENT TO SUCCEED ON THE JOB.

B. INSTRUCTIONAL AREAS

1. ASSESSING THE JOB OPPORTUNITIES AVAILABLE IN FORESTRY

   A. LOCATING INFORMATION REGARDING THE SCOPE OF FORESTRY OCCUPATIONS AND THE OPPORTUNITIES FOR EMPLOYMENT

   B. SURVEYING THE LOCAL REGION FOR ENTRY LEVEL JOBS REGARDING THE NUMBER OF OPENINGS PER YEAR AND FUTURE EMPLOYMENT NEEDS

2. MAKING A DETAILED STUDY OF SELECTED FORESTRY OCCUPATIONS

A. DETERMINING PERSONAL INTERESTS AND HOW THEY RELATE TO A SPECIFIC JOB OR CLUSTER OF OCCUPATIONS

B. ASSESSING THE COMPETENCIES THAT ARE NEEDED FOR ENTRY

C. DETERMINING THE EDUCATIONAL REQUIREMENTS NECESSARY FOR EMPLOYMENT

D. ASSESSING THE PERSONAL TRAITS REQUIRED BY THE OCCUPATION

E. DETERMINING THE WORKER BENEFITS IN A GIVEN OCCUPATION

F. CONSIDERING FEDERAL REGULATIONS WHICH APPLY TO VARIOUS OCCUPATIONS

3. DEVELOPING A PERSONAL PLAN FOR GAINING EXPERIENCES NECESSARY FOR GAINFUL EMPLOYMENT IN A GIVEN OCCUPATIONAL AREA

A. PLANNING ACTIVITIES THAT WILL ENABLE THE STUDENT TO BE EXPOSED TO EXPERIENCES WHICH WILL AID IN HIS EMPLOYMENT

B. WORKING WITH COOPERATORS IN DEVELOPING THE OCCUPATIONAL EXPERIENCE PROGRAM

C. RECORDING THE ACTIVITIES OF THE OCCUPATIONAL EXPERIENCE PROGRAM

D. SUPERVISING AND EVALUATING THE STUDENT'S OCCUPATIONAL EXPERIENCE PROGRAM

4. SECURING A JOB BY FOLLOWING THE PROPER PROCEDURES INVOLVED IN JOB PLACEMENT

A. LOCATING POTENTIAL JOBS THROUGH VARIOUS SOURCES

B. ASSESSING THE JOB DESCRIPTION AND THE STUDENT'S INTERESTS

C. APPLYING FOR A JOB

(1) WRITING A LETTER OF APPLICATION
(2) PREPARING A RESUME
(3) SECURING REFERENCES

D. PARTICIPATING IN THE PERSONAL INTERVIEW

5. CONSIDERING FACTORS IMPORTANT TO JOB SUCCESS AND ADVANCEMENT

   A. ESTABLISHING RAPPORT WITH FELLOW EMPLOYEES, THE PUBLIC AND THE EMPLOYER

   B. PERSONAL GROOMING AND ITS IMPACT UPON THE PUBLIC, THE EMPLOYER AND FELLOW EMPLOYEES

   C. FOLLOWING DIRECTIONS AND WORKING INDEPENDENTLY IN AN OCCUPATION

   D. DEVELOPING DESIRABLE WORK HABITS

   E. CONTINUING SELF-IMPROVEMENT ON THE JOB

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. CONDUCT A PERSONAL SURVEY BY PERSONAL CONTACT OR QUESTIONNAIRE OF FORESTRY BUSINESSES OR AGENCIES TO DETERMINE THE NUMBER OF PERSONNEL EMPLOYED IN VARIOUS JOBS IN FORESTRY AND THE NUMBER OF OPENINGS EACH YEAR.

2. INTERVIEW SEVERAL PERSONS IN SPECIFIC OCCUPATIONS AND DETERMINE THE COMPETENCIES AND REQUIREMENTS NEEDED TO ENTER THE OCCUPATION.

3. A. WRITE A LETTER OF APPLICATION AND FILL OUT AN APPLICATION FORM. HAVE THE CLASS MEMBERS CRITIQUE THE COMPLETED LETTERS AND FORMS.

   B. VISIT THE OPERATORS OF AREA FORESTRY BUSINESSES OR AGENCIES AND DISCUSS WITH THEM THE FACTORS THEY CONSIDER IN HIRING AN EMPLOYEE.

4. USING SIMULATION TECHNIQUES, HAVE THE STUDENTS ROLE PLAY JOB INTERVIEWS. RECORD THE INTERVIEWS ON A TAPE RECORDER AND HAVE EACH STUDENT CRITIQUE HIS OWN PRESENTATION. TO GUIDE THE STUDENTS IN THE CRITIQUE, HAVE THE CLASS DEVELOP A LIST OF CRITERIA FOR JOB INTERVIEWS AND CHECK THEMSELVES AGAINST THESE CRITERIA.

5. USING A PANEL COMPOSED OF EMPLOYERS AND EMPLOYEES, HAVE THE CLASS DISCUSS WITH THEM THE DEVELOPMENT AND MAINTENANCE OF WORKING RELATIONSHIPS BETWEEN EMPLOYEES AND EMPLOYER.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. USING A LIST OF FORESTRY JOB TITLES, HAVE STUDENTS MATCH THESE TO THE MOST APPROPRIATE FORESTRY AREA.

THESE JOB TITLES COULD ALSO BE MATCHED TO LEVEL OF POSITION, SUCH AS SKILLED, SEMI-SKILLED, TECHNICAL AND PROFESSIONAL. THESE TASKS SHOULD BE ACCOMPLISHED WITH 90% ACCURACY TO ALLOW FOR VARIATION IN JOB TITLE NAMES.

2. THE STUDENT WILL COMPLETE A SURVEY OF A GIVEN OCCUPATION OR CLUSTER OF OCCUPATIONS WHICH ASSESSES THE COMPETENCIES NEEDED FOR EMPLOYMENT, THE EDUCATIONAL REQUIREMENTS FOR GAINING EMPLOYMENT AND THE PERSONAL CHARACTERISTICS NEEDED FOR SUCCESSFUL EMPLOYMENT TO THE SATISFACTION OF THE TEACHER.

3. HAVE EACH STUDENT COMPLETE A PERSONAL PLAN FOR OBTAINING EMPLOYMENT IN HIS DESIRED OCCUPATION WHICH SHOULD INCLUDE THE NECESSARY EDUCATION AND WORK EXPERIENCES IN ADDITION TO ANY SPECIAL COMPETENCIES THAT NEED TO BE ACQUIRED.

4. HAVE THE STUDENT DEVELOP A LIST OF POINTS TO REMEMBER OR A CHECK LIST FOR WRITING A LETTER OF APPLICATION FOR A PARTICULAR JOB. THIS LIST SHOULD INCLUDE SUCH ITEMS AS NEATNESS, PROPER INTRODUCTION OF APPLICANT, WHERE APPLICANT CAN BE CONTACTED, REQUEST FOR NECESSARY APPLICATION FORMS, COMPLETENESS AND PERSONAL REFERENCES.

5. THE TEACHER SHOULD EVALUATE EACH STUDENT AS TO HIS ABILITY TO WORK WITH OTHERS IN THE CLASSROOM, WHILE INVOLVED IN ORGANIZATIONAL ACTIVITIES AND/OR IN A COOPERATIVE PLACEMENT SITUATION. THE STUDENT SHOULD COMPLETE A PERSONAL EVALUATION SHEET TO BE USED WHEN DISCUSSING HIS ABILITIES, ATTRIBUTES AND WEAKNESSES WITH THE TEACHER.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. SAMPLES OF JOB APPLICATION FORMS, LETTERS OF APPLICATION, OCCUPATIONAL SURVEY FORMS, PERSONAL CHARACTERISTICS CHECK LISTS, AND COPIES OF STATE AND FEDERAL LABOR REGULATIONS

2. APPROPRIATE TABLES, DESKS, CHAIRS AND TAPE RECORDER OR VIDEO TAPE MACHINES NECESSARY FOR CONDUCTING SIMULATED JOB INTERVIEWS

3. WRITTEN NOTICES FROM NEWSPAPERS, JOURNALS AND OTHER PUBLICATIONS LISTING VARIOUS JOB OPENINGS

F. EXAMPLES OF SUPPORTING REFERENCES

1. BINKLEY, HAROLD AND HAMMONDS, CARSIE. EXPERIENCE PROGRAMS FOR LEARNING VOCATIONS IN AGRICULTURE. DANVILLE,

ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1970, 604 PAGES.

THIS PUBLICATION PRESENTS AN OVERVIEW OF THE EXPERIENCE PROGRAM AND THE OPPORTUNITIES IN FORESTRY THAT STUDENTS WILL FIND RELATIVELY EASY TO UNDERSTAND.

2. CAREERS IN THE LOGGING INDUSTRY. SALEM, OREGON: DEPARTMENT OF HUMAN RESOURCES, STATE OF OREGON EMPLOYMENT DIVISION. 1971, 30 PAGES.

   THIS PAMPHLET CONTAINS JOB TITLES, BRIEF JOB DESCRIPTIONS AND PICTURES OF THE VARIOUS ENTRY LEVEL LOGGING OCCUPATIONS.

3. A JOB WITH THE FOREST SERVICE. PUBLICATION NO. 843. U.S. FOREST SERVICE, U.S. DEPARTMENT OF AGRICULTURE. 1972, 20 PAGES.

   THIS PAMPHLET COVERS NONPROFESSIONAL EMPLOYMENT OPPORTUNITIES WITH THE FOREST SERVICE INCLUDING JOB LEVELS AND APPROXIMATE SALARY RANGES.

4. OPPORTUNITIES IN AGRICULTURAL OCCUPATIONS AND THE EMPLOYEE WITHIN THE BUSINESS ORGANIZATION. COLUMBUS, OHIO: OHIO AGRICULTURAL EDUCATION CURRICULUM MATERIALS SERVICE, THE OHIO STATE UNIVERSITY. 1971, PP. 3-43.

   A STUDENT MANUAL, THIS REFERENCE MAY BE HELPFUL WHEN COVERING SUCH TOPICS AS APPLYING FOR A JOB, ASSESSING ONE'S PERSONAL CHARACTERISTICS, AND LOCATING JOB OPPORTUNITIES.

5. RESOURCE UNIT ON CAREER OPPORTUNITIES FOR CORE CURRICULUM. TUCSON, ARIZONA: DEPARTMENT OF AGRICULTURAL EDUCATION, THE UNIVERSITY OF ARIZONA. 1970, 10 PAGES.

   DEVELOPED IN AN OUTLINE FORMAT, THIS REFERENCE WILL BE HELPFUL TO THE INSTRUCTOR IN DEVELOPING QUESTIONS AND PROBLEMS FOR DISCUSSION. INCLUDED IS A LIST OF FILMSTRIPS AND STUDENT ACTIVITIES FOR EXPLORING AGRICULTURAL OCCUPATIONS.

HUMAN RELATIONS IN FORESTRY

UNIT CONCEPT: MANY JOBS ARE LOST BECAUSE OF POOR HUMAN RELATIONS BETWEEN EMPLOYEE, EMPLOYER AND SUPERVISOR. HUMAN RELATIONS IN TODAY'S SOCIETY IS A "TWO-WAY STREET" AS THE EMPLOYEE HAS A ROLE OR RESPONSIBILITY AND LOYALTY TO THE EMPLOYER AND THE EMPLOYER HAS CERTAIN RESPONSIBILITIES TO THE EMPLOYEES. THE HUMAN RELATIONS PROCESS FOCUSES UPON THE ABILITY TO PRESENT IDEAS AND THE ABILITY TO LISTEN AS PEOPLE RELATE TO EACH OTHER.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHILE PREPARING FOR AN OCCUPATION IN FORESTRY, CONDUCT A SELF-EVALUATION OF HIS PHYSICAL APPEARANCE, SPEECH AND CONVERSATION, AND PERSONALITY AS IT RELATES TO RELATIONS WITH OTHER PERSONS TO THE SATISFACTION OF THE TEACHER.

2. WHILE WORKING IN A FORESTRY OCCUPATION, IMPROVE HIS RELATIONS WITH OTHER PERSONNEL AS EVALUATED BY THE EMPLOYER UTILIZING CRITERIA SUCH AS APPEARANCE, PUNCTUALITY, DEPENDABILITY, PRODUCTION, INITIATIVE AND COOPERATION.

3. WHEN MEETING AND WORKING WITH EMPLOYERS, FELLOW EMPLOYEES OR SUPERVISORS, COMMUNICATE EFFECTIVELY ORALLY OR IN WRITING WITH THESE PERSON(S) TO THE SATISFACTION OF THE TEACHER AND/OR EMPLOYER.

B. INSTRUCTIONAL AREAS

1. DETERMINING HOW PEOPLE FAIL AND SUCCEED ON THE JOB

   A. IDENTIFYING COMMON CAUSES OF JOB FAILURE

   B. RECOGNIZING THE VARIOUS HUMAN NEEDS AND MOTIVES THAT ARE SATISFIED BY OCCUPATIONS

   C. RECOGNIZING HOW HUMAN MOTIVES AND NEEDS AFFECT THE HUMAN RELATIONS PROCESS

2. IDENTIFYING HUMAN RELATIONS ROLES AND SITUATIONS IN FORESTRY OCCUPATIONS

   A. ASSESSING THE EMPLOYEE'S ROLE

B. ASSESSING THE EMPLOYER'S ROLE

C. ASSESSING THE FOREMAN'S OR SUPERVISOR'S ROLE

3. CONSIDERING FACTORS THAT INFLUENCE THE HUMAN RELATIONS PROCESS IN FORESTRY OCCUPATIONS

A. ASSESSING THE INFLUENCE OF PERSONALITY IN HUMAN RELATIONS

(1) CONSIDERING FACTORS THAT INFLUENCE PERSONALITY
(2) CONTROLLING AND IMPROVING YOUR PERSONALITY

B. RELATING WITH YOUR FELLOW EMPLOYEES

(1) IDENTIFYING FEELINGS AND ATTITUDES THAT AFFECT HUMAN RELATIONS WITH FELLOW EMPLOYEES
(2) COOPERATING WITH FELLOW EMPLOYEES TO CREATE A PRODUCTIVE AND PLEASANT WORK ENVIRONMENT

C. RELATING WITH THE FOREMAN OR SUPERVISORS

(1) IMPROVING ATTITUDES TOWARD SUPERVISION
(2) ACCEPTING CRITICISM, ADVICE AND PRAISE
(3) COOPERATING WITH SUPERVISORS IN RECOGNIZING AND SOLVING PROBLEMS THAT AFFECT THE ORGANIZATION

4. DEVELOPING SPEAKING AND WRITING SKILLS

A. CONDUCTING AND PARTICIPATING IN CONVERSATIONS AND DISCUSSIONS

B. USING THE TELEPHONE EFFECTIVELY

C. SPEAKING IN PUBLIC

D. WRITING LEGIBLY AND EFFECTIVELY

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. HAVE EACH STUDENT COMPLETE A SELF-INVENTORY OF HIS PERSONALITY. COMPARE THE STUDENT'S RATINGS WITH THE RATINGS OF OTHERS WHO ARE INVENTORYING HIS PERSONALITY, SUCH AS THE TEACHER AND EMPLOYER.

2. A. HAVE THE STUDENTS CONDUCT A QUESTIONNAIRE SURVEY OF FORESTRY AGENCIES AND INDUSTRIES TO DETERMINE THE MAJOR FACTORS THAT RESULTED IN PERSONS LOSING THEIR JOBS DURING THE LAST FIVE YEARS.

B. HAVE AN EMPLOYER, FOREMAN OR SUPERVISOR FROM A FOREST INDUSTRY VISIT WITH THE CLASS TO DISCUSS THE IMPORTANCE OF ESTABLISHING GOOD HUMAN RELATIONS WITH FELLOW EMPLOYEES, EMPLOYER AND SUPERVISORS.

3. HOLD A LOCAL PUBLIC SPEAKING CONTEST WITH EACH STUDENT GIVING A SPEECH OR TALK CONCERNING A FACET OF FORESTRY.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE EACH STUDENT CONDUCT A SELF INVENTORY OF HIS PHYSICAL APPEARANCE, SPEECH AND CONVERSATION, AND PERSONALITY TO BE USED IN EVALUATION MEETINGS WITH THE TEACHER OR EMPLOYER PROVIDING OCCUPATIONAL WORK EXPERIENCE TO IDENTIFY PERSONAL STRENGTHS AND WEAKNESSES.

2. HAVE EACH STUDENT LIST EIGHT HUMAN RELATIONS SKILLS THAT ARE IMPORTANT IN FORESTRY OCCUPATIONS.

3. VIDEO TAPE EACH STUDENT AS HE GIVES A TALK OR SPEECH OR PARTICIPATES IN A DISCUSSION SESSION SO THAT THE TEACHER AND STUDENT CAN EVALUATE HIS PERFORMANCE.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. APPROPRIATE CLASSROOM EQUIPMENT SUCH AS TAPE RECORDER, TELEPHONE, AND VIDEO TAPE EQUIPMENT

2. APPROPRIATE FORMS FOR SELF EVALUATION

F. EXAMPLES OF SUPPORTING REFERENCES

1. COURSE OF STUDY IN AGRICULTURAL OCCUPATIONS. LEXINGTON, KENTUCKY: DEPARTMENT OF AGRICULTURAL EDUCATION, UNIVERSITY OF KENTUCKY. 1967, 262 PAGES.

   THIS REFERENCE, WHICH IS MOST HELPFUL TO TEACHERS, COVERS IN OUTLINE FORM THE VARIOUS AREAS OF HUMAN RELATIONS. FORMS ARE PROVIDED WHICH MAY BE COMPLETED TO EVALUATE CERTAIN ASPECTS OF HUMAN RELATIONS WITH FELLOW WORKERS AND FOR EMPLOYER-TEACHER EVALUATION OF THE STUDENT.

2. HUMAN RELATIONS IN BUSINESS. COLUMBUS, OHIO: OHIO AGRICULTURAL EDUCATION CURRICULUM MATERIALS SERVICE, THE OHIO STATE UNIVERSITY. 1971, 70 PAGES.

THE STUDENT REFERENCE INCLUDES BRIEF YET COMPREHENSIVE DISCUSSIONS AND EXERCISES WHICH THE STUDENT CAN READ AND COMPLETE TO OBTAIN A BETTER UNDERSTANDING OF THE HUMAN RELATIONS PROCESS.

3. RESOURCE UNIT ON HUMAN RELATIONS. TUCSON, ARIZONA: DEPARTMENT OF AGRICULTURAL EDUCATION, THE UNIVERSITY OF ARIZONA. 1971, 90 PAGES.

AN EXCELLENT REFERENCE FOR TEACHERS, THE COMPLETE AREA OF HUMAN RELATIONS IS COVERED IN OUTLINE FORM. NUMEROUS CASE PROBLEMS ARE PRESENTED FOR STUDENTS AND TEACHERS TO CONSIDER DURING DISCUSSION PERIODS. VARIOUS RATING FORMS FOR SELF-EVALUATION ARE INCLUDED WHICH THE STUDENTS MAY COMPLETE. SAMPLE TEST ITEMS ARE ALSO INCLUDED.

DEVELOPING LEADERSHIP THROUGH FFA

UNIT CONCEPT: ACTIVE PARTICIPATION IN THE FFA WILL PROVIDE THE STUDENT OPPORTUNITIES FOR DEVELOPING PRACTICAL TRAINING IN AGRICULTURE, LEADERSHIP, COOPERATION AND CITIZENSHIP.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. USING THE BASIC PRINCIPLES OF LEADERSHIP, IDENTIFY THE ROLE OF THE FFA ORGANIZATION IN FORESTRY EDUCATION.

2. USING THE OFFICIAL FFA MANUAL, IDENTIFY THE HISTORY, AIMS AND PURPOSES AND ORGANIZATION OF THE FFA ON THE LOCAL, STATE AND NATIONAL LEVEL.

3. BY ACTIVELY PARTICIPATING IN THE ORGANIZATION'S BUSINESS MEETING, DEMONSTRATE THE PRINCIPLES OF PARLIAMENTARY PROCEDURE AS PRESENTED IN ROBERT'S RULES OF ORDER OR OTHER ACCEPTABLE REFERENCES.

4. THROUGH ACTIVE PARTICIPATION IN THE ORGANIZATION, SERVE EFFECTIVELY AS A COMMITTEE MEMBER AND/OR CHAIRMAN IN PLANNING AND CARRYING OUT THE CHAPTER PROGRAM OF ACTIVITIES.

5. IF ELECTED, SERVE EFFECTIVELY AS AN OFFICER IN THE ORGANIZATION BY FULFILLING THE DUTIES OF THE OFFICE TO WHICH ELECTED.

6. THROUGH CHAPTER AND CLASSROOM ACTIVITIES, DEVELOP EFFECTIVE PUBLIC SPEAKING SKILLS SO AS TO BE ABLE TO MAKE INTRODUCTIONS, PARTICIPATE IN CONVERSATIONS AND PREPARE AND DELIVER SPEECHES AND TALKS.

7. THROUGH ACTIVE PARTICIPATION IN THE FFA, DEVELOP A STRONG SELF CONCEPT AND A POSITIVE ATTITUDE TOWARD WORKING IN SOCIETY AS EVIDENCED BY HIS PUBLIC AND PRIVATE ACTIVITIES.

B. INSTRUCTIONAL AREAS

1. DEVELOPING LEADERSHIP

   A. PURPOSES FOR ATTAINING LEADERSHIP SKILLS

B. TYPES OF LEADERSHIP

(1) FORMAL LEADERSHIP
(2) INFORMAL LEADERSHIP

C. QUALITIES OF LEADERSHIP

D. STYLES OF LEADERSHIP

E. FUNCTIONS OF DEMOCRATIC LEADERSHIP

F. OPPORTUNITIES FOR DEVELOPING LEADERSHIP ABILITIES

(1) HOME
(2) SCHOOL
(3) COMMUNITY
(4) FFA

2. DETERMINING THE PLACE OF FFA IN FORESTRY EDUCATION

A. THE VALUES OF FFA MEMBERSHIP

B. THE CONTRIBUTION OF THE FFA TO THE SCHOOL AND COMMUNITY

3. DETERMINING THE BACKGROUND OF THE FFA

A. IMPORTANT HISTORICAL FACTS

B. AIMS AND PURPOSES

C. COLORS, EMBLEM, MOTTO AND CREED

4. GOVERNING AND FINANCING THE FFA

A. LOCAL

B. STATE

C. NATIONAL

5. ATTAINING FFA MEMBERSHIP AND DEGREES

A. TYPES OF MEMBERSHIP

B. LOCAL, STATE AND NATIONAL

6. PLANNING AND CONDUCTING A CHAPTER MEETING

A. IDENTIFYING OFFICER RESPONSIBILITIES

B. IDENTIFYING MEMBER RESPONSIBILITIES

C. CONDUCTING THE BUSINESS MEETING

7. PLANNING AND CONDUCTING THE CHAPTER PROGRAM OF ACTIVITIES

   A. IDENTIFYING AREAS TO BE INCLUDED

   B. DEVELOPING A PROGRAM OF ACTIVITIES

   C. CARRYING OUT THE PROGRAM OF ACTIVITIES

      (1) IDENTIFYING CHAIRMAN RESPONSIBILITIES
      (2) IDENTIFYING COMMITTEE MEMBER RESPONSIBILITIES

8. PERFORMING FFA OFFICER DUTIES AND RESPONSIBILITIES

   A. IDENTIFYING QUALIFICATIONS FOR LOCAL, STATE AND NATIONAL OFFICES

   B. IDENTIFYING SPECIFIC DUTIES OF EACH OFFICER

   C. DETERMINING GENERAL RESPONSIBILITIES OF AN OFFICER

      (1) CONDUCTING CHAPTER PROGRAM
      (2) PARTICIPATING IN OFFICER MEETINGS
      (3) PARTICIPATING IN LEADERSHIP ACTIVITIES
      (4) CONDUCTING CHAPTER MEETINGS

9. DEVELOPING PROFICIENCY IN PARLIAMENTARY PROCEDURE

   A. PRESIDING OVER MEETINGS

   B. PRESENTING MOTIONS CORRECTLY

10. DEVELOPING PUBLIC SPEAKING SKILLS

   A. DEVELOPING CONVERSATION SKILLS

   B. MAKING INTRODUCTIONS

   C. PREPARING A SPEECH OR TALK

   D. DELIVERING A SPEECH OR TALK

11. DETERMINING RESPONSIBILITIES OF FFA MEMBERS

   A. DEVELOPING PERSONAL ATTRIBUTES

      (1) PERSONAL APPEARANCE
      (2) PROPER MANNERS
      (3) BEHAVIOR IN PUBLIC

   B. USING THE FFA CODE OF ETHICS

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. ANALYZE THE QUALITIES OF RECOGNIZED GOOD LEADERS.

2. ATTEND STATE AND/OR NATIONAL FFA CONVENTIONS TO OBSERVE THE OPERATION OF THE ORGANIZATION.

3. A. PARTICIPATE IN CLASSROOM STUDY AND PRACTICE OF PARLIAMENTARY PROCEDURE TO DEVELOP PARLIAMENTARY SKILLS.

   B. PLAN AND POST AGENDA IN ADVANCE OF REGULAR CHAPTER MEETINGS TO PROMOTE ATTENDANCE AND PARTICIPATION BY ALL MEMBERS.

   C. ATTEND AND PARTICIPATE IN FFA MEETINGS TO DEVELOP LEADERSHIP ABILITIES.

   D. PREPARE FOR AND PARTICIPATE IN PARLIAMENTARY PROCEDURE DEMONSTRATIONS AND CONTESTS.

4. A. ACCEPT AN FFA COMMITTEE ASSIGNMENT SUITED TO INTEREST AND ABILITY TO DEVELOP SKILLS IN COMMITTEE WORK

   B. SERVE AS A COMMITTEE CHAIRMAN TO DEVELOP LEADERSHIP SKILLS.

   C. PREPARE WRITTEN AND ORAL COMMITTEE REPORTS AND PRESENT THEM AT FFA MEETINGS TO DEVELOP PERSONAL SKILLS AND TO FACILITATE OPERATION OF THE ORGANIZATION.

   D. PARTICIPATE IN SPECIAL TRAINING PROGRAMS FOR COMMITTEE CHAIRMEN TO OBTAIN SKILLS IN COMMITTEE WORK.

5. A. ARRANGE FOR ELECTION OF FFA OFFICERS AND PARTIPATE AS AN OFFICER, IF ELECTED.

   B. PLAN, CONDUCT AND/OR PARTICIPATE IN LEADERSHIP WORKSHOPS OR OFFICER-TRAINING PROGRAMS.

   C. ESTABLISH PERFORMANCE STANDARDS FOR LOCAL FFA OFFICERS.

6. A. PARTICIPATE IN CLASSROOM DISCUSSIONS, DEMONSTRATIONS, ORAL AND WRITTEN REPORTS, AND LOCAL PUBLIC SPEAKING COMPETITION.

   B. ENTER PUBLIC SPEAKING CONTESTS ABOVE THE LOCAL LEVEL.

   C. PARTICIPATE IN LEADERSHIP ACTIVITIES ABOVE THE LOCAL LEVEL.

   D. PRACTICE MAKING FORMAL INTRODUCTIONS THROUGH ROLE PLAYING.

E. HAVE EACH STUDENT PREPARE A SHORT TALK OR SPEECH TO PRESENT IN CLASS, USING A TAPE RECORDER OR VIDEO TAPE FOR THE STUDENT TO HEAR AND/OR OBSERVE HIS PERFORMANCE.

F. PREPARE AND/OR PARTICIPATE IN RADIO AND TELEVISION PROGRAMS RELATING TO FFA ACTIVITIES.

7. CONDUCT A SELF-EVALUATION OF LEADERSHIP QUALITIES, PERSONALITY CHARACTERISTICS, AND OTHER PERSONAL ATTRIBUTES, IDENTIFYING STRONG POINTS TO BUILD UPON AND WEAK POINTS NEEDING IMPROVEMENT.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE EACH STUDENT LIST THE QUALITIES OF A DEMOCRATIC LEADER SO THAT ATTAINMENT OF THE QUALITIES WOULD RESULT IN A PERSON DISPLAYING DEMOCRATIC LEADERSHIP.

2. DEVELOP A MATCHING TEST IN WHICH EACH STUDENT WOULD MATCH THE PARTS OF THE FFA EMBLEM WITH WHAT IT SYMBOLIZES WITH COMPLETE ACCURACY.

3. DIVIDE THE CLASS INTO GROUPS TO PRESENT A BUSINESS MEETING. THE TEACHER SHOULD EVALUATE EACH GROUP AND MEMBER AS TO THEIR POISE AND KNOWLEDGE OF PARLIAMENTARY PROCEDURE.

4. HAVE EACH MEMBER ASSIGNED RESPONSIBILITIES FOR ASSISTING IN PLANNING AND CONDUCTING THE CHAPTER PROGRAM OF ACTIVITIES. EVALUATE EACH MEMBER IN REFERENCE TO COMPLETION OF HIS ASSIGNED TASKS AND THE IMPROVEMENT THAT HE EXHIBITS OVER EACH GRADING PERIOD.

5. HAVE THE SECRETARY, TREASURER AND REPORTER REGULARLY SUBMIT THEIR BOOKS TO THE AUDITING COMMITTEE AND TEACHER FOR EVALUATION AS TO COMPLETENESS, NEATNESS AND ACCURACY.

6. CONDUCT A PUBLIC-SPEAKING CONTEST IN EACH CLASS FOR THE TEACHER TO EVALUATE EACH STUDENT FOR HIS PRESENTATION IN RELATION TO HIS SPEAKING ABILITIES.

7. HAVE EACH STUDENT COMPLETE A PERSONAL EVALUATION FORM AS TO HIS ATTITUDES TOWARD HIMSELF AND SOCIETY. THE TEACHER SHOULD PRIVATELY DISCUSS THE PERSONAL EVALUATION WITH EACH STUDENT TO RECOGNIZE STRONG POINTS AND WEAK POINTS NEEDING IMPROVEMENT.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. OFFICIAL FFA PARAPHERNALIA

2. OFFICIAL FFA SECRETARY'S AND TREASURER'S BOOKS

3. OFFICIAL FFA SCRAPBOOK

4. TAPE RECORDER OR VIDEO TAPE

F. EXAMPLES OF SUPPORTING REFERENCES

1. BENDER, RALPH E. THE FFA AND YOU. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1962, 494 PAGES.

   THIS TEXT COVERS ALL AREAS OF FFA PROGRAM ACTIVITIES AS WELL AS OFFICER AND MEMBER DUTIES AND RESPONSIBILITIES. AN EXCELLENT REFERENCE FOR BEGINNING MEMBERS AND OFFICERS.

2. MEMBERSHIP - THE PATHWAY TO LEADERSHIP. COLUMBUS, OHIO: OHIO AGRICULTURAL EDUCATION CURRICULUM MATERIALS SERVICE, THE OHIO STATE UNIVERSITY. 1962, 23 PAGES.

   AN AID FOR TEACHER UNIT PLANNING AND FOR THE STUDENT, THIS BOOKLET EMPHASIZES FUNDAMENTAL LEADERSHIP COMPETENCIES TO BE DEVELOPED BY ALL MEMBERS.

3. OFFICIAL MANUAL, FUTURE FARMERS OF AMERICA. ALEXANDRIA, VIRGINIA: FUTURE FARMERS SUPPLY SERVICE. 1972, 128 PAGES.

   THIS MANUAL WILL ASSIST BOTH MEMBERS AND ADVISORS IN GAINING AN UNDERSTANDING OF THE HISTORY, ORGANIZATION AND OPERATION OF THE FFA.

4. STEWART, W. F. HELPS IN MASTERING PARLIAMENTARY PROCEDURE. COLUMBUS, OHIO: OHIO AGRICULTURAL EDUCATION CURRICULUM MATERIALS SERVICE, THE OHIO STATE UNIVERSITY. 1961, 17 PAGES.

   A SIMPLE AND EASILY UNDERSTOOD BOOKLET CONTAINING THE BASIC RULES OF PARLIAMENTARY PROCEDURE. IT ALSO INCLUDES A QUICK REFERENCE CHART WITH REQUIREMENTS FOR EACH TYPE OF MOTION.

OUTDOOR FIRST AID

UNIT CONCEPT: EFFECTS OF PERSONAL INJURIES TO PERSONS EMPLOYED IN FORESTRY OCCUPATIONS, ESPECIALLY THOSE WORKING IN REMOTE AREAS, CAN BE MINIMIZED WITH THE USE OF PROPER FIRST AID TECHNIQUES.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. IDENTIFY THE IMPORTANCE, SCOPE AND LIMITATIONS OF FIRST AID IN TREATING ACCIDENT VICTIMS IN FORESTRY OCCUPATIONS.

2. USE THE FOLLOWING FIRST AID TECHNIQUES IN SIMULATED SITUATIONS WITH COMPETENCY INDICATED IN THE FIRST AID TEXTBOOK:

   A. TREATING WOUNDS,

   B. TREATING SPRAINS AND FRACTURES,

   C. TREATING FOR SHOCK,

   D. TREATING POISONING,

   E. TREATING POISONOUS BITES AND PLANT POISONING,

   F. TREATING BURNS,

   G. ADMINISTERING ARTIFICIAL RESPIRATION, AND

   H. TRANSPORTING INJURED PERSONS.

B. INSTRUCTIONAL AREAS

1. DETERMINING THE SCOPE OF FIRST AID

   A. IDENTIFYING FORESTRY OCCUPATIONS REQUIRING FIRST AID SKILLS

   B. IDENTIFYING TYPES OF FIRST AID SKILLS NEEDED IN FORESTRY OCCUPATIONS

   C. IDENTIFYING THE LIMITATIONS OF FIRST AID

   D. IDENTIFYING INDIVIDUAL RESPONSIBILITY AND LIABILITY

2. USING FIRST AID TECHNIQUES

A. TREATING WOUNDS

(1) IDENTIFYING TYPE OF WOUND
(2) IDENTIFYING AND USING FIRST AID METHODS

B. TREATING SPRAINS AND FRACTURES

(1) IDENTIFYING SYMPTOMS
(2) IDENTIFYING AND USING FIRST AID METHODS

C. TREATING FOR SHOCK

(1) IDENTIFYING SIGNS AND SYMPTOMS
(2) IDENTIFYING CAUSES
(3) IDENTIFYING AND USING FIRST AID METHODS

D. TREATING BURNS

(1) USING FIRST AID ON THERMAL BURNS
(2) USING FIRST AID ON CHEMICAL BURNS
(3) TREATING SUNBURN AND EXCESSIVE HEAT PROBLEMS
(4) TREATING EXCESSIVE COLD PROBLEMS

E. TREATING POISONING

(1) IDENTIFYING COMMON CHEMICAL POISONS AND THEIR EFFECTS
(2) IDENTIFYING SIGNS AND SYMPTOMS
(3) ADMINISTERING FIRST AID

F. TREATING POISONOUS BITES AND PLANT POISONING

(1) IDENTIFYING THE CAUSE OF THE POISONING

(A) IDENTIFYING POISONOUS SNAKES IN THE REGION
(B) IDENTIFYING POISONOUS ARACHNIDS AND INSECTS
(C) IDENTIFYING POISONOUS PLANTS

(2) ADMINISTERING FIRST AID

G. USING ARTIFICIAL RESPIRATION

(1) DETERMINING CONDITIONS WHEN ARTIFICIAL RESPIRATION IS NEEDED
(2) ADMINISTERING ARTIFICIAL RESPIRATION

H. TRANSPORTING INJURED PERSONS

(1) IDENTIFYING SITUATIONS REQUIRING MOVEMENT OF PATIENTS

(2) PREPARING THE PATIENT
(3) IDENTIFYING METHODS OF TRANSFER

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. HAVE PERSONS INVOLVED IN FORESTRY OCCUPATIONS DISCUSS THE FIRST AID REQUIREMENTS IN THEIR OCCUPATIONS.

2. A. SET UP SIMULATED WOUNDS USING STUDENTS AS PATIENTS AND HAVING OTHERS ADMINISTER FIRST AID.

B. HAVE THE STUDENTS PRACTICE USING DIFFERENT METHODS OF ARTIFICIAL RESPRIATION WITH STUDENTS SIMULATING PATIENTS.

C. HAVE THE STUDENTS PRACTICE USING AN APPROVED FIRST AID SNAKE BITE KIT UNDER SIMULATED SITUATIONS.

D. HAVE REPRESENTATIVES OF THE LOCAL RED CROSS CHAPTER, HOSPITAL OR EMERGENCY SERVICES AS RESOURCE PERSONS TO DEMONSTRATE FIRST AID EQUIPMENT SUPPLIES AND TECHNIQUES.

E. HAVE STUDENTS FIND THE NAMES AND ADDRESSES OF AREA EMERGENCY SERVICES AND POISON TREATMENT CENTERS.

F. HAVE STUDENTS PREPARE A BULLETIN BOARD SHOWING POISONOUS AND NON-POISONOUS SNAKES, SPIDERS AND INSECTS COMMON TO THE AREA.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE THE STUDENTS LIST FIVE FORESTRY OCCUAPTIONS AND AT LEAST FOUR FIRST AID REQUIREMENTS FOR EACH OCCUPATION.

2. HAVE EACH STUDENT DEMONSTRATE AT LEAST FOUR FIRST AID SKILLS ASSIGNED BY THE TEACHER. EVALUATE THE STUDENTS AS TO CORRECTNESS OF PROCEDURE.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. FIRST AID KITS

2. SNAKE BITE KITS

F. EXAMPLES OF SUPPORTING REFERENCES

1. COLLINS, HENRY HILL, JR. COMPLETE FIELD GUIDE TO AMERICAN WILDLIFE. NEW YORK, NEW YORK: HARPER AND ROWE

PUBLISHERS, INC. 1959, 683 PAGES.

THIS TEXT CONTAINS INFORMATION AND COLOR PICTURES OF THE POISONOUS SNAKES FOUND IN THE UNITED STATES.

2. FIRST AID TEXTBOOK. WASHINGTON, D.C.: THE AMERICAN NATIONAL RED CROSS. 1957, 249 PAGES.

THIS TEXT WILL BE A VALUABLE REFERENCE FOR THE TEACHER AND STUDENT WHILE LEARNING AND PRACTICING FIRST AID TECHNIQUES.

OPERATION AND CARE OF THE CHAIN SAW

UNIT CONCEPT: PROPER CHAIN SAW STARTING, OPERATION, CLEANING AND CARE WILL PROMOTE CHAIN SAW EFFICIENCY AND LONGER LIFE WITH A MINIMUM OF ANNOYANCE AND EXPENSE.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. IDENTIFY AND EXPLAIN THE BASIC FUNCTIONS OF THE MAJOR PARTS OF A CHAIN SAW AND EXPLAIN THE OPERATING PRINCIPLES WITH ACCURACY REQUIRED TO PROPERLY OPERATE AND CARE FOR THE SAW.

2. SELECT THE APPROPRIATE CHAIN SAW TO USE FOR A JOB CONSIDERING THE SAW CAPABILITIES AND THE WORKING CONDITIONS SUCH AS BUCKING, LIMBING OR FELLING.

3. USE THE PROPER PROCEDURES FOR PREPARING TO START AND STARTING A CHAIN SAW, INCLUDING REFUELING, TO PREVENT STARTING TROUBLES AND ACCIDENTS.

4. OPERATE, ADJUST ENGINE LOAD AND WORKING PARTS AND STOP A CHAIN SAW USING PROCEDURES WHICH PROMOTE OPTIMUM ENGINE EFFICIENCY AND OPERATOR SAFETY.

5. PROPERLY CLEAN A CHAIN SAW TO PREVENT OVERHEATING, PROMOTE ENGINE EFFICIENCY AND PREVENT EXCESSIVE WEAR DUE TO DIRT ENTERING THE ENGINE.

6. PREPARE A CHAIN SAW FOR STORAGE OF THREE OR MORE MONTHS' DURATION TO PREVENT CORROSION AND DAMAGE.

B. INSTRUCTIONAL AREAS

1. IDENTIFYING OPERATING PRINCIPLES OF TWO STROKE CYCLE ENGINES

   A. IDENTIFYING PARTS

   B. IDENTIFYING CARBURETION PRINCIPLES

   C. IDENTIFYING FUNCTIONS OF THE COMPRESSION STROKE

D. IDENTIFYING FUNCTIONS OF THE POWER STROKE

2. IDENTIFYING MAJOR PARTS OF A CHAIN SAW

A. ENGINE PARTS

B. CHAIN AND BAR PARTS

3. SELECTING THE CHAIN SAW

A. DETERMINING SAW CAPABILITIES

B. IDENTIFYING WORKING CONDITIONS

4. REFUELING THE CHAIN SAW

A. SELECTING THE FUEL

B. MIXING THE OIL-GASOLINE MIXTURE

C. FILLING THE TANK USING SAFETY PRECAUTIONS

5. STARTING THE CHAIN SAW

A. PERFORMING REQUIRED SERVICING

B. IDENTIFYING SAFETY PRECAUTIONS

C. OPERATING STARTING MECHANISMS

6. OPERATING THE CHAIN SAW

A. IDENTIFYING SAFETY PRECAUTIONS

B. MAINTAINING PROPER SPEED

C. SELECTING PROPER LOAD

D. DEVELOPING TECHNIQUES FOR SAWING IN DIFFERENT POSITIONS

E. PREVENTING PINCHING

F. MAKING MINOR ADJUSTMENTS

(1) ADJUSTING CHAIN TENSION
(2) MAKING CARBURETOR ADJUSTMENTS

7. CLEANING THE CHAIN SAW

A. CLEANING THE OUTSIDE OF THE ENGINE, CLUTCH AND BAR

B. CLEANING THE MUFFLER AND SPARK ARRESTER

C. CLEANING THE COOLING SYSTEM

D. CLEANING AND SERVICING THE AIR CLEANER

E. IDENTIFYING BROKEN OR EXCESSIVELY WORN PARTS

8. STORING THE CHAIN SAW

A. PREVENTING CORROSION AND MOISTURE BUILD-UP

B. PREVENTING GUM DEPOSITS

C. PREVENTING DUST BUILD-UP AND PHYSICAL DAMAGE

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. USE A CUT-AWAY MODEL OF A TWO STROKE CYCLE ENGINE TO OBSERVE OPERATING PRINCIPLES AND TO LEARN THE PARTS AND THEIR FUNCTIONS.

2. DEVELOP A DEMONSTRATION TO SHOW THE STUDENTS THE DIFFERENT TYPES OF CHAIN SAWS AND HOW EACH SHOULD BE USED.

3. MAKE A CHECK LIST OF SAFETY PROCEDURES TO FOLLOW BEFORE, DURING AND AFTER STARTING A CHAIN SAW.

4. A. HAVE A FOREST INDUSTRY REPRESENTATIVE OR SERVICE FORESTER AS A RESOURCE PERSON TO ASSIST STUDENTS IN DEVELOPING SAFE SAWING TECHNIQUES.

   B. HAVE STUDENTS PRACTICE ADJUSTING CHAIN SAW TENSION AND CARBURETOR HIGH SPEED AND IDLE SPEED ADJUSTMENTS.

5. HAVE THE STUDENTS PRACTICE CLEANING THE AIR FILTER, COOLING SYSTEM, CLUTCH, BAR AND MUFFLER AFTER OPERATING THE CHAIN SAW.

6. DEMONSTRATE TO THE STUDENTS THE PROPER PROCEDURES FOR PREPARING A CHAIN SAW FOR STORAGE.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE EACH STUDENT IDENTIFY AND EXPLAIN THE OPERATING PRINCIPLES OF THE DIFFERENT PARTS OF A CHAIN SAW AND ITS TWO STROKE CYCLE ENGINE.

2. HAVE THE STUDENTS SELECT THE MOST APPROPRIATE CHAIN SAW TO BE USED UNDER DIFFERENT HYPOTHETICAL WORKING CONDITIONS.

3. HAVE EACH STUDENT SAFELY START, OPERATE AND STOP A CHAIN SAW UNDER FIELD CONDITIONS.

4. HAVE EACH STUDENT PERFORM MINOR OPERATING ADJUSTMENTS ON A CHAIN SAW SUCH AS ADJUSTING CHAIN TENSION UNDER FIELD CONDITIONS.

6. HAVE EACH STUDENT LIST THE STEPS FOR PROPERLY PREPARING A CHAIN SAW FOR STORAGE FOR THREE MONTHS OR MORE INDICATING PROCEDURES WHICH WILL LIMIT CORROSION, DEPOSITS AND DAMAGE.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. CHAIN SAWS

2. CUT-AWAY MODEL OF A TWO STROKE CYCLE ENGINE

3. AIR COMPRESSOR

4. "DEGREASER" SOLVENTS

5. SMALL ENGINE AND CHAIN SAW HAND TOOLS

F. EXAMPLES OF SUPPORTING REFERENCES

1. CHAIN SAW OPERATORS' MANUALS.

   THESE MANUALS WILL PROVIDE DETAILED INFORMATION FOR OPERATION, MAINTENANCE AND CARE OF THE SPECIFIC BRANDS OF CHAIN SAWS.

2. CHAIN SAW SERVICE MANUAL. KANSAS CITY, MISSOURI: TECHNICAL PUBLICATIONS DIVISION, INTERTEC PUBLISHING CORPORATION. 1970, 240 PAGES.

   THIS MANUAL COVERS IDENTIFICATION AND REPAIR OF SAW CHAIN AND BAR PROBLEMS AS WELL AS DETAILED DIAGRAMS AND PARTS LISTS OF THE MAJOR CHAIN SAW BRANDS.

3. SMALL ENGINES. VOLUME I. ATHENS, GEORGIA: ENGINEERING CENTER, AMERICAN ASSOCIATION FOR VOCATIONAL INSTRUCTIONAL MATERIALS. 1968, 150 PAGES.

   THIS REFERENCE CONTAINS A COMPLETE DISCUSSION OF SMALL ENGINE OPERATING PRINCIPLES, OPERATING PROCEDURES AND CARE.

CHAIN SAW MAINTENANCE

UNIT CONCEPT: TROUBLESHOOTING AND REGULAR MAINTENANCE OF A CHAIN SAW, WHICH INCLUDES SERVICING THE CARBURETOR, AIR CLEANER, SPARK PLUG, SHARPENING AND MAINTAINING THE CHAIN AND MAINTAINING THE GUIDE BAR, WILL RESULT IN INCREASED CHAIN SAW EFFICIENCY AND LONGER LIFE.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN USING OPERATORS' MANUALS, COMMON CHAIN SAWS AND NECESSARY TOOLS, IDENTIFY THE DIFFERENT TYPES OF CARBURETOR AIR CLEANERS COMMONLY FOUND ON CHAIN SAW ENGINES AND CLEAN AND SERVICE THEM ACCORDING TO THE MANUFACTURER'S SPECIFICATIONS.

2. WHEN GIVEN A CHAIN SAW WITH A MALADJUSTED CARBURETOR, ADJUST THE IDLE SPEED AND HIGH SPEED CARBURETOR ADJUSTMENTS WHICH WILL RESULT IN MAXIMUM ENGINE EFFICIENCY WHEN CUTTING.

3. WHEN GIVEN CARBON-FOULED OR WORN SPARK PLUGS FROM CHAIN SAWS, SERVICE THE OLD PLUG OR SELECT A NEW ONE TO REPLACE IT ACCORDING TO THE MANUFACTURER'S SPECIFICATIONS.

4. WHEN USING APPROPRIATE FILES, FILE HOLDER, FILING VISE AND DEPTH GAUGE, SHARPEN SAW CHAINS OF THE TYPE COMMON TO THE AREA WITH ACCURACY REQUIRED TO MAKE STRAIGHT, EFFICIENT CUTS.

5. REMOVE BROKEN LINKS OR DAMAGED SAW CHAIN PARTS AND REPLACE THEM USING A PUNCH, HAMMER AND FILE ACCORDING TO MANUFACTURER'S SPECIFICATIONS.

6. WHEN GIVEN A CHAIN SAW WITH A DAMAGED OR WORN CHAIN, SELECT, LUBRICATE, ADJUST AND BREAK IN THE NEW SAW CHAIN ACCORDING TO MANUFACTURER'S SPECIFICATIONS.

7. TROUBLESHOOT PROBLEMS CONCERNING THE SAW CHAIN, GUIDE BAR AND/OR SPROCKET AND MAKE NEEDED REPLACEMENT OR REPAIRS ON CHAIN SAWS WITH WORN OR MALFUNCTIONING PARTS ACCORDING TO THE MANUFACTURER'S SPECIFICATIONS.

8. WHEN GIVEN A CHAIN SAW WITH A WORN OR BROKEN STARTER ROPE, REPAIR AND/OR REPLACE THE STARTER ROPE ACCORDING TO INSTRUCTIONS IN THE OPERATOR'S MANUAL.

B. INSTRUCTIONAL AREAS

1. SERVICING CHAIN SAW CARBURETOR AIR CLEANERS

A. IDENTIFYING THE TYPE OF AIR CLEANER

B. CLEANING THE AIR CLEANER ELEMENT

C. REPLACING AIR FILTERS

2. ADJUSTING THE CHAIN SAW CARBURETOR

A. ADJUSTING THE HIGH SPEED SCREW

B. ADJUSTING THE IDLE SPEED SCREW

C. ADJUSTING THE CHOKE

3. SERVICING CHAIN SAW SPARK PLUGS

A. CLEANING THE SPARK PLUG

B. RESETTING THE GAP

C. SELECTING A REPLACEMENT SPARK PLUG

4. SHARPENING SAW CHAINS

A. IDENTIFYING THE COMMON TYPES OF SAW CHAINS

(1) CHIPPER-TYPE
(2) CHISEL TOOTH CHAIN
(3) OTHER

B. SELECTING APPROPRIATE EQUIPMENT

C. MAINTAINING CORRECT ANGLES, DEPTHS AND DISTANCES

5. REPAIRING BROKEN AND/OR WORN SAW CHAIN PARTS

A. REMOVING PARTS TO BE REPLACED

B. INSTALLING NEW PARTS

C. ADJUSTING NEW PARTS

6. REPLACING SAW CHAINS

A. SELECTING THE NEW CHAIN

(1) IDENTIFYING SAWING CONDITIONS
(2) IDENTIFYING SAW MODEL AND BAR SIZE

B. LUBRICATING NEW CHAINS

C. ADJUSTING NEW CHAINS

7. TROUBLESHOOTING SAW CHAIN PROBLEMS

A. IDENTIFYING AND REPAIRING CUTTER PROBLEMS

(1) DAMAGED CUTTERS
(2) INCORRECTLY FILED CUTTERS

B. IDENTIFYING AND REPAIRING DRIVE LINK PROBLEMS

(1) REPLACING DAMAGED DRIVE LINKS
(2) REPLACING SPROCKETS
(3) ALIGNING SPROCKET AND BAR GROOVE
(4) ADJUSTING CHAIN TENSION

C. IDENTIFYING AND REMEDYING TIGHT JOINTS

(1) REPAIRING OR REPLACING GUIDE BAR
(2) INSTALLING NEW SPROCKET

D. IDENTIFYING AND REMEDYING CAUSES OF CROOKED CUTTING

(1) CHECKING CUTTERS
(2) REPAIRING OR REPLACING GUIDE BARS

8. TROUBLESHOOTING GUIDE BAR PROBLEMS

A. IDENTIFYING AND REPAIRING SOLID NOSE BAR PROBLEMS

(1) REPAIRING SPLITS
(2) RESHAPING THE BAR
(3) REPLACING THE BAR

B. IDENTIFYING AND REPAIRING ROLLER NOSE BAR PROBLEMS

(1) LUBRICATING THE ROLLER NOSE
(2) MAINTAINING SIDE PLATES
(3) REPLACING THE ROLLER

9. IDENTIFYING SPROCKET PROBLEMS

A. IDENTIFYING CAUSES OF SPROCKET PROBLEMS

B. REPLACING WORN SPROCKETS

10. REPLACING THE STARTER ROPE

A. DISASSEMBLING THE UNIT

B. INSTALLING THE NEW ROPE

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. DEMONSTRATE THE EFFECTS OF A DIRTY AIR CLEANER ON CHAIN SAW ENGINE PERFORMANCE BY PARTIALLY BLOCKING THE AIR INTAKE TO THE CARBURETOR AND LISTENING TO THE RESULTING ENGINE PERFORMANCE AND OBSERVING THE EFFECTS ON THE ENGINE'S POWER.

2. HAVE THE STUDENTS TRY TO SAW A LOG WITH A CHAIN SAW WITH A MALADJUSTED CARBURETOR. DEMONSTRATE HOW TO ADJUST THE CARBURETOR AND HAVE THE STUDENTS SAW THE LOG AGAIN TO OBSERVE THE CHANGE IN ENGINE PERFORMANCE AND EFFICIENCY.

3. CLEAN AND SET A SPARK PLUG ACCORDING TO THE OPERATOR'S MANUAL USING A SPARK PLUG FEELER GAUGE.

4. PRACTICE SHARPENING SAW CHAINS USING PROPER TOOLS AND TECHNIQUES. CHECK THE PERFORMANCE OF THE CHAIN AFTER SHARPENING.

5. PRACTICE MAKING NEEDED REPAIRS TO SAW CHAINS SUCH AS REPLACING LINKS USING OPERATORS' MANUALS AS GUIDES.

6. GIVEN SAW MODEL AND SAWING CONDITIONS, HAVE THE STUDENT DETERMINE THE REPLACEMENT CHAIN THAT WOULD BE MOST APPROPRIATE TO USE.

7. OBTAIN SAW CHAINS, GUIDE BARS AND SPROCKETS THAT ARE IN DIFFERENT STAGES OF DISREPAIR AND DETERMINE THE POSSIBLE CAUSES OF THE PROBLEMS.

8. HAVE THE STUDENT REPLACE A BROKEN OR FRAYED ROPE ON A CHAIN SAW ENGINE.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE THE STUDENTS LIST THE TYPES OF AIR CLEANERS FOUND ON COMMON CHAIN SAWS AND DESCRIBE THE STEPS THAT SHOULD BE USED TO SERVICE EACH TYPE WITH ACCURACY NEEDED TO PROPERLY MAINTAIN EACH TYPE OF AIR CLEANER.

2. HAVE EACH STUDENT ADJUST A CHAIN SAW CARBURETOR THAT HAS BEEN MALADJUSTED. EVALUATE THE STUDENT'S PERFORMANCE

BY HIS USE OF PROPER TECHNIQUES AND BY HAVING HIM SAW A SECTION FROM A LOG TO OBSERVE THE SAW PERFORMANCE.

3. GIVE EACH STUDENT A FOULED OR WORN SPARK PLUG FOR HIM TO SERVICE OR REPLACE. EVALUATE THE STUDENT AS TO HOW WELL HE SERVICES THE PLUG AND SETS THE GAP OR IF HE SELECTS THE CORRECT PLUG TO REPLACE THE OLD ONE.

4. GIVE EACH STUDENT A WORN SAW CHAIN TO SHARPEN. EVALUATE THE STUDENT'S PERFORMANCE WITH THE NECESSARY DEPTH AND ANGLE GAUGES AND BY EVALUATING THE PERFORMANCE OF THE SAW AS A CUT IS MADE.

5. HAVE EACH STUDENT REPLACE A DRIVE LINK IN A SAW CHAIN, EVALUATING THE STUDENT ON CORRECTNESS OF PROCEDURE AS INDICATED IN OPERATORS' MANUALS.

6. HAVE EACH STUDENT LIST THE PROCEDURE HE WOULD FOLLOW IN SELECTING, LUBRICATING, ADJUSTING AND BREAKING IN A NEW SAW CHAIN WITH ACCURACY NEEDED TO INDICATE THAT THE NEW CHAIN WOULD WORK CORRECTLY WITHOUT DAMAGE TO IT OR THE CHAIN.

7. OBTAIN TWO OR THREE CHAIN SAWS WITH ONE OR MORE CHAIN, SPROCKET OR BAR PROBLEMS ON EACH. EVALUATE THE STUDENTS AS TO HOW WELL THEY CAN IDENTIFY THE PROBLEMS AND RECOMMEND CORRECTIVE ACTION WHICH WOULD SOLVE THE PROBLEMS.

8. HAVE EACH STUDENT LIST THE STEPS HE WOULD FOLLOW IN REPLACING A STARTER ROPE ON THE CHAIN SAW WITH THE PROCEDURE TO INDICATE THAT THE STARTER AND ROPE WOULD FUNCTION PROPERLY.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. CHAIN SAWS
2. COMMON SMALL ENGINE HAND TOOLS
3. SPARK PLUG FEELER GAUGE
4. EXAMPLES OF SPARK PLUGS
5. IGNITION FILE
6. SAW CHAINS AND GUIDE BARS IN DISREPAIR
7. SAW CHAIN SHARPENING TOOLS - FILES, VISES, GUIDES AND GAUGES

F. EXAMPLES OF SUPPORTING REFERENCES

1. CHAIN SAW OPERATORS' MANUALS.

   THESE MANUALS WILL PROVIDE DETAILED INFORMATION FOR OPERATION, MAINTENANCE AND CARE OF THE SPECIFIC BRANDS OF CHAIN SAWS.

2. CHAIN SAW SERVICE MANUAL. KANSAS CITY, MISSOURI: TECHNICAL PUBLICATIONS DIVISION, INTERTEC PUBLISHING CORPORATION. 1970, 240 PAGES.

   THIS BOOK CONTAINS GENERAL SAW CHAIN MAINTENANCE AND TROUBLESHOOTING PROCEDURES AS WELL AS DETAILED DIAGRAMS FOR DISASSEMBLY AND ASSEMBLY OF THE MAJOR CHAIN SAW BRANDS. THIS BOOK WOULD BE BEST USED AS A TEACHER'S GUIDE.

OPERATION AND MAINTENANCE OF GASOLINE AND DIESEL POWER UNITS

UNIT CONCEPT: REGULAR MAINTENANCE OF POWER UNITS INCLUDING DAILY LUBRICATION, MAINTENANCE OF THE OIL AND COOLING SYSTEMS, AND PROPER OPERATION OF THE UNITS WILL RESULT IN GREATER ENGINE EFFICIENCY, LONGER ENGINE LIFE AND INCREASED OPERATOR SAFETY.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. IDENTIFY THE PRINCIPLES OF OPERATION OF GASOLINE AND DIESEL POWER UNITS WITH ACCURACY NEEDED TO DETERMINE WHICH TYPE OF ENGINE A SPECIFIED UNIT HAS.

2. SELECT AND MAINTAIN BATTERIES FOR POWER UNITS INCLUDING USE OF A HYDROMETER TO TEST BATTERY ELECTRICAL CONDITION TO OBTAIN OPTIMUM BATTERY PERFORMANCE WITH A MINIMUM OF UNNECESSARY WEAR OR DAMAGE.

3. IDENTIFY PARTS OF POWER UNITS REQUIRING FREQUENT GREASING, SELECT GREASE AND GREASE UNITS ACCORDING TO SPECIFICATIONS IN THE OPERATOR'S MANUAL.

4. MAINTAIN DRY-TYPE AND OIL BATH AIR CLEANERS ACCORDING TO OPERATOR'S MANUAL SPECIFICATIONS.

5. SELECT APPROPRIATE OIL, MAINTAIN OIL LEVELS AND CHANGE OIL WHEN NECESSARY IN THE CRANKCASE, TRANSMISSION AND HYDRAULIC SYSTEMS IN GASOLINE AND DIESEL POWER UNITS ACCORDING TO THE OPERATOR'S MANUAL.

6. MAINTAIN THE COOLING SYSTEM ON GASOLINE AND DIESEL POWER UNITS TO PREVENT FREEZING, OVERHEATING, CORROSION AND DEPOSITS.

7. SELECT AND MAINTAIN SPARK PLUGS FOR GASOLINE POWER UNITS ACCORDING TO THE MANUFACTURER'S SPECIFICATIONS.

8. REFUEL GASOLINE AND DIESEL POWER UNITS IN A MANNER WHICH WILL AVOID FIRE HAZARDS AND FOREIGN MATERIAL IN THE FUEL SYSTEM.

9. SAFELY START, OPERATE AND STOP SKIDDERS, CRAWLERS AND OTHER COMMONLY USED POWER UNITS AS DIRECTED IN THE OPERATORS' MANUALS.

B. INSTRUCTIONAL AREAS

1. IDENTIFYING PRINCIPLES OF ENGINE OPERATION

A. IDENTIFYING PRINCIPLES OF GASOLINE ENGINES

B. IDENTIFYING PRINCIPLES OF DIESEL ENGINES

2. SERVICING BATTERIES

A. SELECTING REPLACEMENT BATTERIES

(1) DETERMINING POWER REQUIREMENTS
(2) DETERMINING OPERATING CONDITIONS

B. MAINTAINING BATTERIES

(1) MAINTAINING LIQUID LEVEL
(2) MAINTAINING TERMINALS AND CLAMPS
(3) USING A HYDROMETER TO CHECK ELECTRICAL CONDITION
(4) RECHARGING BATTERIES

3. GREASING POWER UNITS

A. SELECTING GREASE

B. IDENTIFYING PARTS REQUIRING GREASE

C. LOCATING GREASE FITTINGS

D. USING A GREASE GUN

E. DEVELOPING A LUBRICATION SCHEDULE

4. MAINTAINING AIR CLEANERS

A. MAINTAINING DRY-TYPE CLEANERS

B. MAINTAINING OIL BATH TYPE CLEANERS

5. MAINTAINING THE HYDRAULIC, TRANSMISSION AND CRANKCASE OIL SYSTEMS

A. SELECTING OIL

B. MAINTAINING PROPER OIL LEVEL

C. CHANGING OIL

D. CHANGING OIL FILTERS

6. MAINTAINING THE COOLING SYSTEM

   A. SELECTING COOLANT

   B. MAINTAINING PROPER COOLANT LEVEL

   C. PREVENTING CORROSION AND DEPOSITS

   D. PREVENTING FREEZING AND OVERHEATING

   E. CLEANING THE COOLING SYSTEM

7. MAINTAINING SPARK PLUGS

   A. SELECTING SPARK PLUGS TO MEET ENGINE SPECIFICATIONS

   B. CLEANING AND CONDITIONING PLUGS

   C. SETTING THE GAP

8. REFUELING GASOLINE AND DIESEL UNITS

   A. SELECTING FUEL

   B. KEEPING OUT DIRT AND MOISTURE

   C. AVOIDING FIRE HAZARDS

   D. REMOVING WATER FROM DIESEL FUEL SYSTEMS

9. OPERATING GASOLINE AND DIESEL POWER UNITS

   A. STARTING GASOLINE AND DIESEL UNITS

      (1) IDENTIFYING SAFETY PRECAUTIONS
      (2) IDENTIFYING STARTING PROCEDURES

   B. OPERATING POWER UNITS

      (1) IDENTIFYING SAFETY PRECAUTIONS
      (2) OPERATING POWER TAKE-OFF EQUIPMENT
      (3) HITCHING EQUIPMENT TO TRACTORS, CRAWLERS AND OTHER UNITS
      (4) ADJUSTING ENGINE SPEED TO LOAD
      (5) OPERATING POWER UNITS UNDER VARYING FIELD CONDITIONS

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. OBSERVE GASOLINE AND DIESEL UNITS TO COMPARE DIFFERENCES IN METHODS OF SUPPLYING FUEL TO THE CYLINDERS, IGNITION SYSTEMS, ETC.

2. A. USE A HYDROMETER TO PRACTICE CHECKING THE ELECTRICAL CONDITION OF BATTERIES WHICH HAVE BEEN USED UNDER VARYING FIELD CONDITIONS.

   B. CONSTRUCT A SIMPLE BATTERY USING A BEAKER, SULFURIC ACID SOLUTION, AND ZINC AND COPPER STRIPS. USE VOLTMETERS AND AMMETERS TO MEASURE VOLTAGE AND AMPERAGE PRODUCED.

3. HAVE THE STUDENTS DIAGRAM THE POWER UNITS WITH WHICH THEY WILL BE WORKING AND INDICATE THE LOCATION OF THE GREASE FITTINGS NEEDING FREQUENT GREASING.

4. HAVE PAIRS OF STUDENTS DEMONSTRATE TO THE REMAINDER OF THE CLASS HOW TO SERVICE EACH TYPE OF AIR CLEANER FOUND ON GASOLINE AND DIESEL POWER UNITS.

5. COMPARE OIL VISCOSITY AND GRADE USED IN THE HYDRAULIC, TRANSMISSION AND CRANKCASE OIL SYSTEMS TO INDICATE THE IMPORTANCE OF CORRECT OIL SELECTION.

6. A. PLACE A THERMOSTAT IN HOT AND COLD WATER TO INDICATE HOW IT CONTROLS ENGINE COOLANT TEMPERATURE.

   B. SET UP A DEMONSTRATION WITH COOLANT AND TWO OR MORE DIFFERENT METALS SUCH AS STAINLESS STEEL, BRASS, SOLDER OR ALUMINUM AND COPPER CONNECTED BY A COPPER WIRE. OBSERVE THE BATTERY ACTION WHICH CAUSES ONE OF THE METALS TO BE EATEN AWAY.

7. USE A SPARK PLUG GAUGE TO PRACTICE SETTING THE GAP ON SPARK PLUGS.

8. A. MIX WATER AND DIESEL FUEL TOGETHER AND GASOLINE AND WATER TO OBSERVE THE DIFFERENCES IN SETTING OUT OF THE WATER AND TO EMPHASIZE THE IMPORTANCE OF DRAINING OFF WATER FROM A DIESEL ENGINE BEFORE STARTING.

   B. DEVELOP A HOME SYSTEM OF STORING FUELS AND LUBRICANTS OBSERVING NECESSARY SAFETY PRECAUTIONS.

9. A. OBTAIN STATISTICS WHICH INDICATE NUMBERS OF FORESTRY-RELATED ACCIDENTS EACH YEAR AND THEIR CAUSES. DETERMINE WHICH ONES MIGHT HAVE BEEN PREVENTED BY OBSERVING SAFETY PRECAUTIONS WHILE STARTING, OPERATING OR STOPPING POWER UNITS.

   B. HAVE STUDENTS ENROLL IN VOCATIONAL AGRICULTURE OR 4-H TRACTOR OR FARM SAFETY PROGRAM.

   C. HAVE STUDENTS OPERATE TRACTORS AND CRAWLERS UNDER VARIOUS CONDITIONS BY SETTING UP A COURSE THROUGH

WHICH THE STUDENTS MUST MANEUVER TO DEMONSTRATE THEIR ABILITIES.

D. USE AN ELECTRIC DRILL TO DEMONSTRATE POWER TAKE-OFF SAFETY.

E. USE MODEL TRACTORS AND CRAWLERS TO DEMONSTRATE HOW TIPPING ACCIDENTS OCCUR.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. PRESENT THE STUDENTS WITH DESCRIPTIONS OF A NUMBER OF ENGINES. HAVE THE STUDENTS INDICATE FROM THE DESCRIPTION WHETHER EACH IS A GASOLINE OR DIESEL POWER UNIT.

2. HAVE EACH STUDENT TEST A BATTERY USING A HYDROMETER WITH EVALUATION TO BE BASED ON CORRECTNESS OF PROCEDURE AND ACCURACY.

3. GIVE THE STUDENTS A DIAGRAM OF A COMMONLY USED TRACTOR OR CRAWLER. HAVE THEM INDICATE ON THE DIAGRAM THE APPROXIMATE LOCATION OF THE GREASE FITTINGS WITH A MINIMUM OF 90% ACCURACY.

4. HAVE EACH STUDENT SERVICE A DRY-TYPE OR OIL BATH AIR CLEANER FOR EVALUATION. PROCEDURES USED SHOULD BE THOSE INDICATED IN THE OPERATOR'S MANUAL.

5. HAVE EACH STUDENT CHANGE THE OIL AND OIL FILTER, IF NECESSARY, ON A POWER UNIT. EVALUATE THE STUDENT AS TO CORRECTNESS OF PROCEDURE AND SELECTION OF THE APPROPRIATE OIL AND FILTER.

6. HAVE THE STUDENTS LIST THE CORRECT PROCEDURES FOR MAINTAINING AN ENGINE COOLING SYSTEM WHICH WILL PREVENT OVERHEATING, FREEZING, CORROSION AND DEPOSITS.

7. GIVE EACH STUDENT DIRTY OR WORN SPARK PLUGS TO SERVICE. THE PLUG GAP SHOULD BE WITHIN ± .002" OF THE SETTING RECOMMENDED IN THE OPERATOR'S MANUAL.

8. HAVE THE STUDENTS LIST THE PROCEDURES THAT SHOULD BE FOLLOWED WHEN REFUELING A GASOLINE OR DIESEL POWER UNIT. THE PROCEDURES LISTED SHOULD INCLUDE SAFETY PROCEDURES AS WELL AS THOSE WHICH WOULD HELP PROTECT THE FUEL SYSTEM FROM WATER AND OTHER FOREIGN MATTER.

9. HAVE EACH STUDENT DRIVE A TRACTOR OR CRAWLER AND IMPLEMENT THROUGH A COURSE WHICH WOULD REQUIRE OPERATOR SKILLS COMPARABLE TO THOSE NEEDED IN THE FIELD. EVALUATE THE STUDENT ON HIS SKILLS AND OBSERVANCE OF SAFETY PRECAUTIONS.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. HYDROMETER
2. BEAKER
3. METAL STRIPS - ZINC, COPPER, STAINLESS STEEL, BRASS, SOLDER
4. SULFURIC ACID SOLUTION
5. COOLANT
6. VARIOUS TYPES OF OIL
7. SPARK PLUG FEELER GAUGE
8. VOLTMETERS AND AMMETERS
9. THERMOSTAT
10. ELECTRIC DRILL
11. MODELS OF TRACTORS AND CRAWLERS
12. TRACTOR AND/OR CRAWLER
13. BATTERIES
14. GREASE GUN AND GREASE
15. WRENCHES, SOCKETS AND OTHER ENGINE TOOLS

F. EXAMPLES OF SUPPORTING REFERENCES

1. OPERATING FARM TRACTORS AND MACHINERY, EFFICIENTLY, SAFELY. AMES, IOWA: PUBLICATIONS DISTRIBUTION CENTER, IOWA STATE UNIVERSITY OF SCIENCE AND TECHNOLOGY. 1969, 81 PAGES.

   ALTHOUGH THIS PUBLICATION IS ORIENTED TOWARD FARM TRACTOR AND MACHINERY OPERATION, THE MATERIAL PROVIDES PRINCIPLES OF OPERATION WHICH WOULD APPLY TO MOST SITUATIONS WHERE POWER UNITS AND EQUIPMENT ARE BEING USED.

2. TRACTOR MAINTENANCE. ATHENS, GEORGIA: ENGINEERING CENTER, AMERICAN ASSOCIATION FOR VOCATIONAL INSTRUCTIONAL MATERIALS. 1970, 145 PAGES.

THIS BOOKLET IS DESIGNED TO PROVIDE MAINTENANCE INFORMATION FOR TRACTORS, BUT WOULD BE USEFUL FOR WORK WITH MOST POWER UNITS.

3. TRACTOR OPERATION AND DAILY CARE. ATHENS, GEORGIA: ENGINEERING CENTER, AMERICAN ASSOCIATION FOR VOCATIONAL INSTRUCTIONAL MATERIALS. 1967, 120 PAGES.

THIS BOOKLET WOULD BE A VALUABLE STUDENT REFERENCE. IT CONTAINS INFORMATION THAT WOULD BE USEFUL IN OPERATING AND CARING FOR GASOLINE AND DIESEL POWER UNITS.

READING AND INTERPRETING TOPOGRAPHICAL MAPS AND AERIAL PHOTOGRAPHS IN FORESTRY

UNIT CONCEPT: PLANNING OF SUCH FOREST OPERATIONS AS TIMBER STAND IMPROVEMENT AND HARVESTING AS WELL AS PROPER SITE SELECTION FOR LOGGING ROADS, LOG YARDS AND FIRE LANES IS FACILITATED BY PROPER INTERPRETATION AND UTILIZATION OF TOPOGRAPHICAL MAPS AND AERIAL PHOTOGRAPHS.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. IDENTIFY THE TYPES AND USES OF TOPOGRAPHICAL MAPS AND AERIAL PHOTOGRAPHS IN THE FOREST INDUSTRY.

2. USE AERIAL PHOTOGRAPH INTERPRETATION EQUIPMENT FOR DETERMINING SITE CLASSIFICATION, DETERMINING VEGETATION TYPES AND DENSITIES, TREE IDENTIFICATION, DETERMINING TREE HEIGHTS AND ESTIMATING VOLUMES WITH ACCURACY REQUIRED FOR DEVELOPING FOREST MANAGEMENT AND HARVESTING PRACTICES.

3. USE A TOPOGRAPHIC MAP TO IDENTIFY DIFFERENCES IN ELEVATION, WATERWAYS, FORESTED AREAS, AND OTHER LAND FEATURES WITH ACCURACY NEEDED FOR WORK AS A FORESTRY AIDE.

B. INSTRUCTIONAL AREAS

1. IDENTIFYING THE USES OF TOPOGRAPHICAL MAPS AND AERIAL PHOTOGRAPHS

   A. IDENTIFYING TOPOGRAPHIC FEATURES

   B. DEVELOPING PLANIMETRIC AND SPECIALIZED MAPS

   C. MAKING FOREST INVENTORIES

   D. MAKING ADMINISTRATIVE DECISIONS

2. IDENTIFYING TYPES OF AERIAL PHOTOGRAPHS

   A. DETERMINING DIFFERENCES IN VERTICAL AND OBLIQUE PHOTOGRAPHS

   B. IDENTIFYING TYPES OF PRINTS

C. IDENTIFYING DIFFERENCES IN SCALE

3. INTERPRETING AERIAL PHOTOGRAPHS

A. USING THE STEREOSCOPE

B. USING THE PLANIMETER AND GRIDS

C. INTERPRETING LAND AND VEGETATIVE FEATURES

4. USING AERIAL PHOTOGRAPHS FOR PLANNING

A. PLANNING CULTURAL PRACTICES

B. PLANNING HARVESTING PRACTICES

C. PLANNING SPECIAL FEATURES

5. INTERPRETING AND USING TOPOGRAPHIC MAPS

A. DETERMINING SCALE

B. IDENTIFYING ELEVATION FEATURES

C. IDENTIFYING LAND FEATURES

D. PLANNING ROAD AND YARD LOCATIONS

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. HAVE A SERVICE FORESTER OR FOREST INDUSTRY REPRESENTATIVE INDICATE THE USES THEY MAKE OF TOPOGRAPHICAL MAPS AND AERIAL PHOTOGRAPHS.

2. A. HAVE REPRESENTATIVES OF THE FOREST INDUSTRY OR A SERVICE FORESTER ASSIST STUDENTS IN INTERPRETING TOPOGRAPHIC MAPS AND AERIAL PHOTOGRAPHS.

   B. HAVE THE STUDENTS DEVELOP PLANS FOR FOREST MANAGEMENT, HARVESTING AND LAYING OUT FOREST ROADS AND LOG YARDS USING TOPOGRAPHIC MAPS AND AERIAL PHOTOGRAPHS. HAVE FOREST INDUSTRY REPRESENTATIVES ASSIST IN EVALUATING THE PLANS, IF NEEDED.

3. HAVE THE STUDENTS FIND THE ACTUAL LOCATION OF FEATURES INDICATED TO THEM ON A TOPOGRAPHIC MAP.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE EACH STUDENT LIST THE BASIC TYPES AND USES OF AERIAL

PHOTOGRAPHS AND TOPOGRAPHIC MAPS AS USED IN THE FOREST INDUSTRY.

2. HAVE EACH STUDENT USE AERIAL PHOTOGRAPHS AND TOPOGRAPHIC MAPS TO PLAN FORESTRY PRACTICES, OPERATIONS AND LOGGING FEATURES, SUCH AS, ROADS, FIRE LANES AND LOG YARD SITES, ON SITES SUITABLE FOR SUCH PURPOSES.

3. DEVELOP AN EXAMINATION IN WHICH THE STUDENTS ARE TO FIND THE DIFFERENCES IN ELEVATION BETWEEN POINTS ON TOPOGRAPHIC MAPS AND TO LOCATE GIVEN TOPOGRAPHIC FEATURES.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. AERIAL PHOTOGRAPHS
2. TOPOGRAPHIC MAPS
3. STEREOSCOPES
4. PLANIMETERS
5. AERIAL PHOTOGRAPH INTERPRETATION GRIDS
6. GRAPHIC SCALES

F. EXAMPLES OF SUPPORTING REFERENCES

1. AVERY, EUGENE T. INTERPRETATION OF AERIAL PHOTOGRAPHS. MINNEAPOLIS, MINNESOTA: BURGESS PUBLISHING COMPANY. 1968, 324 PAGES.

   THIS IS AN EXCELLENT TEACHER REFERENCE FOR PROCEDURES TO FOLLOW IN INTERPRETING AERIAL PHOTOGRAPHS.

2. FORESTER'S GUIDE TO AERIAL PHOTO INTERPRETATION. AGRICULTURAL HANDBOOK 308. WASHINGTON, D.C.: U.S. FOREST SERVICE, U.S. DEPARTMENT OF AGRICULTURE. 1966, 41 PAGES.

   THIS REFERENCE CONTAINS TECHNICAL INFORMATION FOR USING AERIAL PHOTOGRAPHS IN THE FOREST INDUSTRY WHICH INCLUDES MEASURING AREAS, IDENTIFYING FOREST AND TREE CHARACTERISTICS AND CRUISING.

TREE IDENTIFICATION

UNIT CONCEPT: IF THE FORESTRY STUDENT IS ABLE TO ACCURATELY IDENTIFY THE COMMON TREE SPECIES IN HIS AREA, HE WILL HAVE A BASIS FOR PERFORMING MANY OF THE OPERATIONS IN FORESTRY OCCUPATIONS.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN A GROUP OF ECONOMICALLY IMPORTANT TREES COMMON TO THE AREA, CORRECTLY IDENTIFY EACH BY SCIENTIFIC AND/OR COMMON NAME WITH THE AID OF REFERENCES OR AN IDENTIFICATION KEY.

B. INSTRUCTIONAL AREAS

1. IDENTIFYING TREES

   A. USING LEAF CHARACTERISTICS

      (1) DETERMINING TYPE OF LEAF ARRANGEMENT
      (2) IDENTIFYING TYPE OF MARGIN
      (3) CONSIDERING SIZE AND SHAPE
      (4) CONSIDERING TEXTURE AND COLOR
      (5) OTHER

   B. OBSERVING FLOWERS

   C. OBSERVING TYPE OF FRUIT PRESENT

      (1) IDENTIFYING NUTS
      (2) IDENTIFYING BERRIES
      (3) IDENTIFYING CONES
      (4) IDENTIFYING WINGED FRUIT PODS
      (5) OTHER

   D. USING TWIG CHARACTERISTICS

      (1) IDENTIFYING CHARACTERISTICS OF BUDS AND LEAF SCARS
      (2) CONSIDERING PITH CHARACTERISTICS
      (3) CONSIDERING COLOR

   E. USING THE BARK

(1) DETERMINING ROUGHNESS
(2) DETERMINING COLOR

F. USING TASTE AND SMELL

G. OBSERVING TREE GROWTH CHARACTERISTICS

(1) CONSIDERING SHAPE OF CROWN
(2) CONSIDERING PERSISTENCE OF DEAD BRANCHES
(3) BUTTRESSING OR SWELLING OF LOWER TRUNK

H. OBSERVING THE SITE CONDITIONS

(1) CONSIDERING TOPOGRAPHIC FEATURES
(2) CONSIDERING SOIL TYPE, CONDITION AND DRAINAGE
(3) CONSIDERING SURROUNDING VEGETATION

I. IDENTIFYING THE RANGE OR DISTRIBUTION OF TREE SPECIES

(1) CONSIDERING THE SOILS PRESENT
(2) CONSIDERING THE CLIMATE

J. IDENTIFYING HYBRID SPECIES

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. HAVE STUDENTS USE TREE IDENTIFICATION REFERENCES AND TREE KEYS FOR THE STATE OR REGION TO IDENTIFY VARIOUS TREES ON THE SCHOOL LAND LABORATORY BY THEIR COMMON AND SCIENTIFIC NAMES.

   B. HAVE EACH STUDENT DEVELOP A NOTEBOOK WITH TREE IDENTIFICATION KEYS, DIAGRAMS AND LEAF, BUD AND TWIG SPECIMENS OF THE ECONOMICALLY IMPORTANT TREES FOUND IN HIS AREA.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. PREPARE A PRACTICAL EXAMINATION IN WHICH THE STUDENT IS TO IDENTIFY AT LEAST THIRTY ECONOMICALLY IMPORTANT TREES THAT ARE FOUND IN HIS STATE OR REGION. A FIELD TRIP TO AN ARBORETUM MAY BE NECESSARY TO HAVE A SUFFICIENT NUMBER OF TREES TO USE.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. NOTEBOOK

2. PLANT KEYS FOR COMMON TREES

F. EXAMPLES OF SUPPORTING REFERENCES

1. ANDERSON, DAVID A. AND SMITH, WILLIAM A. FORESTS AND FORESTRY. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1970, 357 PAGES.

   THIS TEXT WOULD BE OF PARTICULAR VALUE TO TEACHERS AND STUDENTS IN THE SOUTHERN SECTION OF THE UNITED STATES AS THE TREE IDENTIFICATION MATERIAL APPLIES PARTICULARLY TO THAT AREA.

2. DEAN, F. W., CHADWICK, L. C. AND COWEN, W. F. OHIO TREES. CURRENT EDITION. COLUMBUS, OHIO: THE UNIVERSITY BOOKSTORE, THE OHIO STATE UNIVERSITY. 127 PAGES.

   THIS BOOKLET CONTAINS DIAGRAMS AND DISCUSSIONS OF LEAF, TWIG AND BUD CHARACTERISTICS USED IN TREE IDENTIFICATION AS WELL AS KEYS TO DECIDUOUS AND EVERGREEN TREES. IT WOULD BE MOST APPLICABLE IN THE NORTH CENTRAL STATES.

3. HARVESTING FORESTRY PRODUCTS. KIRBYVILLE, TEXAS: VOCATIONAL INSTRUCTIONAL SERVICES, TEXAS STATE DEPARTMENT OF EDUCATION. 1971, 200 PAGES.

   THIS HANDBOOK CONTAINS EXCELLENT DRAWINGS AND DIAGRAMS OF TREE AND LEAF PARTS USED IN TREE IDENTIFICATION.

II

FOREST ESTABLISHMENT
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NURSERY PRODUCTION OF TREE SEEDLINGS

ESTABLISHING THE FOREST

NURSERY PRODUCTION OF TREE SEEDLINGS

UNIT CONCEPT: SINCE MOST FOREST LANDOWNERS DO NOT PRODUCE THEIR OWN TREE SEEDLINGS, GOVERNMENT AND PRIVATE TREE NURSERIES ARE DEPENDED UPON TO SUPPLY THE DEMAND FOR THEM. FOREST NURSERY EMPLOYEES NEED SKILLS IN PRODUCTION AND CARE OF TREE SEEDLINGS TO PRODUCE HEALTHY, VIGOROUS SEEDLINGS FOR PLANTING.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN A SPECIFIED LOCATION FOR TREE SEEDLING PRODUCTION, PREPARE THE SEEDBED AND SOIL FOR SOWING THE SEED WHICH SHOULD INCLUDE LAYING OUT THE PLOTS, DEVELOPING DRAINAGE, TILLING THE SOIL, CORRECTING SOIL PH, AND FERTILIZING THE SOIL.

2. WHEN GIVEN A PREPARED SEEDBED, PREPARE THE TREE SEEDS, SOW THEM AND APPLY MULCH WHICH SHOULD RESULT IN AN ACCEPTABLE SURVIVAL RATE FOR THE SPECIES.

3. CARE FOR YOUNG FOREST TREE SEEDLINGS UPON SPROUTING WHICH SHOULD INCLUDE MULCHING, WEEDING, WATERING, FERTILIZING AND PROTECTING THEM FROM SUN AND WIND.

4. LIFT AND PACK TREE SEEDLINGS UNDER NURSERY CONDITIONS WITH ACCURACY NEEDED TO PROTECT THE SEEDLINGS UNTIL PLANTING.

B. INSTRUCTIONAL AREAS

1. PREPARING THE SEEDBED

   A. DETERMINING THE PROPER SIZE FOR THE SEEDBED

   B. LOCATING THE SEEDBED FOR ADEQUATE AIR MOVEMENT AND EXPOSURE TO SUNLIGHT

   C. PREPARING THE SEEDBED SOIL

      (1) CORRECTING PH LEVEL AND SOIL FERTILITY LEVEL

         (A) TAKING SOIL SAMPLES
         (B) INTERPRETING SOIL SAMPLE RESULTS
         (C) APPLYING LIME MATERIALS WHEN NEEDED

(2) TILLING THE SEEDBED
(3) APPLYING FERTILIZERS WHEN NEEDED
(4) FUMIGATING THE SEEDBED SOIL TO PREVENT DAMPING-OFF
(5) OPERATING AND MAINTAINING SEEDBED PREPARATION EQUIPMENT

2. SEEDING

A. TREATING SEEDS TO PREVENT FUNGI DISEASES

B. BROADCASTING THE SEEDS

C. COVERING THE SEEDS

D. MULCHING THE SEEDBED

E. WATERING THE SEEDBED TO PROMOTE GERMINATION

3. CARING FOR YOUNG FOREST TREE SEEDLINGS

A. SHADING

B. MULCHING TO PREVENT FROST HEAVING

(1) SELECTING THE TYPE OF MULCH TO USE
(2) DETERMINING PROPER TIME FOR APPLYING AND REMOVING MULCH EACH YEAR

C. WEEDING

D. WATERING

(1) OPERATING WATERING EQUIPMENT
(2) DETERMINING AMOUNT AND FREQUENCY OF WATER APPLICATIONS

E. FERTILIZING THE SEEDLINGS

F. PROTECTING THE SEEDLINGS FROM PESTS

4. LIFTING TREE SEEDLINGS

A. OPERATING THE EQUIPMENT

B. PREVENTING INJURY TO ROOTS

5. PACKING TREE SEEDLINGS

A. USING PACKING MATERIAL TO PREVENT ROOT DRYING

B. INDICATING AGE AND TYPE OF PLANTING STOCK BY NUMBERS

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. HAVE THE STUDENTS SELECT A SITE AND PREPARE A SEEDBED FOR GROWING TREE SEEDLINGS ON THE LAND LABORATORY. GIVE PAIRS OF STUDENTS RESPONSIBILITY FOR SELECTED PLOTS.

2. HAVE THE STUDENTS PROPERLY SEED THE PREPARED SEEDBEDS USING POPULAR TREE SPECIES FOR HOME USE OR USE IN THE LAND LABORATORY.

3. HAVE EACH PAIR OF STUDENTS DEVELOP AND IMPLEMENT A PLAN FOR CARING FOR THEIR SELECTED PLOTS OF SEEDLINGS.

4. TAKE THE STUDENTS ON A FIELD TRIP TO A FOREST NURSERY TO OBSERVE SEEDLING LIFTING AND PACKING METHODS.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. EVALUATE EACH PAIR OF STUDENTS ON THEIR PERFORMANCE WHILE PREPARING THE SEEDBED FOR THEIR PLOT AND ON THE APPEARANCE OF THE FINISHED SEEDBED AS INDICATED IN ACTIVITY ONE.

2. EVALUATE EACH PAIR OF STUDENTS AS THEY PREPARE THEIR TREE SEEDS AND SOW THEM AS INDICATED IN ACTIVITY TWO.

3. HAVE EACH STUDENT LIST THE FACTORS WHICH SHOULD BE CONSIDERED WHEN DEVELOPING A PLAN FOR MANAGING TREE NURSERY SEEDLINGS.

4. HAVE EACH STUDENT WRITE A DESCRIPTION OF THE TREE-LIFTING AND PACKING OPERATION IN A NURSERY. THE DESCRIPTION SHOULD INCLUDE ALL PRECAUTIONS USED TO PREVENT ROOT INJURY.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. COMMONLY USED HAND AND POWER EQUIPMENT FOR SEEDBED PREPARATION AND PLANTING

2. TREE NURSERY MATERIALS

   A. SEEDS

   B. FERTILIZERS

   C. LIME

   D. MULCHES

E. WATERING DEVICES

F. SHADE FRAMES

F. EXAMPLES OF SUPPORTING REFERENCES

1. MANAGEMENT OF FOREST RESOURCES FOR MULTIPLE USE. UNIVERSITY PARK, PENNSYLVANIA: DEPARTMENT OF AGRICULTURAL EDUCATION, THE PENNSYLVANIA STATE UNIVERSITY. 1970, 124 PAGES.

   PROBLEM AREA THREE IN THIS RESOURCE UNIT COVERS THE ELEMENTS OF FOREST NURSERY WORK CONSIDERED IN THIS UNIT.

ESTABLISHING THE FOREST

UNIT CONCEPT: PROPER DEVELOPMENT AND IMPLEMENTATION OF PLANS FOR FOREST ESTABLISHMENT WILL RESULT IN INCREASED PRODUCTION OF TIMBER ALONG WITH NUMEROUS OTHER BENEFITS TO MAN.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. IDENTIFY AND EXPLAIN AT LEAST EIGHT BENEFITS OF FOREST RESOURCES TO MAN.

2. WHEN GIVEN A SITE TO BE ESTABLISHED OR RE-ESTABLISHED AS A FOREST, DEVELOP A REFORESTATION PLAN WHICH SHOULD INCLUDE THE METHOD TO BE USED, THE SEEDBED PREPARATION REQUIRED, THE TREE SPECIES, AND THE SPACING BETWEEN THE TREES.

3. WHEN GIVEN A SITE AND SPECIFIC METHOD OF REFORESTATION, PREPARE THE SEEDBED IN THE PRESCRIBED MANNER.

4. WHEN GIVEN A SITE AND SPECIFIC PLANTING OR SEEDING METHOD, PLANT OR SEED THE TREES WITH LESS THAN 20% LOSS.

B. INSTRUCTIONAL AREAS

1. IDENTIFYING BENEFITS OF THE FOREST

   A. IDENTIFYING FOREST USES

   B. DETERMINING FOREST VALUES

      (1) IDENTIFYING CASH PRODUCTS
      (2) DETERMINING AESTHETIC AND RECREATION VALUES

2. DEVELOPING THE REFORESTATION PLAN

   A. SELECTING THE METHOD OF FOREST REPRODUCTION

      (1) IDENTIFYING NATURAL METHODS
      (2) IDENTIFYING ARTIFICIAL METHODS

   B. ANALYZING THE PLANTING OR SEEDING SITE

      (1) DETERMINING SOIL CHARACTERISTICS
      (2) DETERMINING PHYSICAL FEATURES OF THE SITE

(3) DETERMINING NEEDED SEEDBED PREPARATION
(4) SELECTING TREE SPECIES

(A) IDENTIFYING INTENDED USE
(B) IDENTIFYING SITE CONDITIONS

C. PLANNING FOR PLANTING OR SEEDING

(1) DETERMINING SPACING
(2) DETERMINING STOCKING RATES
(3) DETERMINING DESIRED TYPE OF STAND
(4) SELECTING APPROPRIATE SEASON

3. PREPARING THE SITE FOR PLANTING OR SEEDING

A. USING MECHANICAL MEANS

B. USING CHEMICAL MEANS

C. USING FIRE

D. OPERATING AND MAINTAINING SEEDBED PREPARATION AND PLANTING EQUIPMENT

4. PLANTING OR SEEDING THE SITE

A. OBTAINING AND HANDLING SEEDS AND SEEDLINGS

(1) DETERMINING SOURCES AND COSTS OF SEEDS AND SEEDLINGS
(2) TRANSPORTING SEEDLINGS
(3) HANDLING BEFORE AND DURING PLANTING OR SEEDING

B. PLANTING AND SEEDING TREES

(1) PLANTING SEEDLINGS BY HAND
(2) PLANTING SEEDLINGS BY MACHINE
(3) SEEDING BY HAND BROADCASTING
(4) SEEDING BY MACHINES OR FROM THE AIR

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. SHOW SLIDES, FILMSTRIPS AND FILMS ON FOREST IMPORTANCE AND ESTABLISHMENT.

2. A. RECOMMEND A PLANTING OR SEEDING PLAN FOR AN AREA DESIGNATED FOR AFFORESTATION OR REFORESTATION.

B. OBSERVE TREE PLANTATIONS EXHIBITING PROPER AND IMPROPER SELECTION OF TREE SPECIES.

3. TAKE FIELD TRIPS TO PLANTING OR SEEDING SITES TO OBSERVE AND/OR ASSIST IN EQUIPMENT OPERATION DURING SEEDBED PREPARATION AND PLANTING.

4. SELECT A SITE ON THE SCHOOL LAND LABORATORY OR ON A COOPERATOR'S LAND FOR AFFORESTATION OR REFORESTATION, SELECT TREES, PREPARE THE SITE, AND PLANT OR SEED THE AREA.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE EACH STUDENT LIST EIGHT BENEFITS OF THE FOREST TO MAN.

2. ASSIGN THE STUDENTS A LAND AREA TO BE ESTABLISHED OR RE-ESTABLISHED AS A FOREST. HAVE EACH STUDENT DEVELOP A COMPLETE PLAN FOR REFORESTATION WHICH SHOULD INCLUDE THE METHOD TO BE USED, THE SEEDBED PREPARATION THAT WOULD BE NECESSARY, AND PLANTING PROCEDURES. IF NEEDED, A SERVICE FORESTER OR FOREST INDUSTRY REPRESENTATIVE COULD BE USED TO ASSIST IN EVALUATING THE PLANS.

3. HAVE THE CLASS PREPARE A SITE ON THE SCHOOL LAND LABORATORY OR ON A COOPERATOR'S LAND FOR PLANTING OR SEEDING TO TREES. EVALUATE THE GROUP MEMBERS AS TO THEIR EQUIPMENT OPERATION ABILITIES AND THE CONDITION OF THE PREPARED SITE.

4. HAVE THE GROUP PLANT OR SEED THE PREPARED SITE IN THE PRESCRIBED MANNER WITH EACH STUDENT TO BE EVALUATED ON HIS INDIVIDUAL PERFORMANCE.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. HARD HATS

2. CHAIN SAWS

3. BRUSH AXES

4. DIRECT SEEDERS

5. PLANTING BARS

6. PLANTING MATTOCKS

7. CHEMICAL SPRAYER --- HAND AND/OR POWER

8. FARM TRACTOR WITH DISC-TYPE HARROW

F. EXAMPLES OF SUPPORTING REFERENCES

1. MANAGEMENT OF FOREST RESOURCES FOR MULTIPLE USE. UNIVERSITY PARK, PENNSYLVANIA: DEPARTMENT OF AGRICULTURAL EDUCATION, THE PENNSYLVANIA STATE UNIVERSITY. 1970, 124 PAGES.

   PROBLEM AREA 3 IN THIS REFERENCE CONTAINS A DISCUSSION OF FOREST REGENERATION FROM PRODUCTION OF TREE SEEDLINGS TO PLANTING AND SEEDING.

2. MANAGING THE FAMILY FOREST. BULLETIN NO. F 2187. WASHINGTON, D.C.: U.S. DEPARTMENT OF AGRICULTURE, U.S. GOVERNMENT PRINTING OFFICE. 1962, 61 PAGES.

   THIS BULLETIN CONTAINS A CHAPTER ON NATURAL FOREST REGENERATION AND TREE PLANTING. IT WOULD BE VALUABLE FOR STUDENT USE.

73/74

III

FOREST PROTECTION
U.S.O.E. CODE 01.07 02 00 00

FOREST DISEASE, INSECT AND PEST CONTROL

FIRE PREVENTION AND CONTROL

TIMBER MANAGEMENT PRACTICES

FOREST DISEASE, INSECT AND PEST CONTROL

UNIT CONCEPT: EACH YEAR, INSECTS, DISEASES AND OTHER DESTRUCTIVE AGENTS CAUSE LOSSES OF BILLIONS OF BOARD FEET OF TIMBER. TO KEEP THE LOSS OF TIMBER AT A MINIMUM, FOREST MANAGEMENT MUST INCLUDE IDENTIFICATION OF EXISTING AND POTENTIAL PEST PROBLEMS AND EFFECTIVE PREVENTION, TREATMENT AND CONTROL.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. IDENTIFY FIVE MAJOR TREE DISEASES IN HIS REGION AND DESCRIBE THE SYMPTOMS OF AFFECTED TREES WITH COMPLETE ACCURACY.

2. SELECT THE MOST APPROPRIATE CONTROL MEASURE FOR A GIVEN DISEASE AND SITUATION AND PERFORM THE NECESSARY PREVENTION OR CONTROL PROCEDURES WITH ACCURACY NEEDED TO KEEP DISEASE LOSSES IN THE FOREST AT A MINIMUM.

3. IDENTIFY EIGHT MAJOR TREE INSECTS IN HIS REGION AND DESCRIBE THE DAMAGE THEY CAUSE WITH COMPLETE ACCURACY.

4. SELECT THE MOST APPROPRIATE CONTROL MEASURE FOR A GIVEN INSECT AND SITUATION AND PERFORM THE NECESSARY PREVENTION OR CONTROL PROCEDURES WITH ACCURACY NEEDED TO KEEP INSECT LOSSES IN THE FOREST AT A MINIMUM.

5. DETERMINE THE EFFECTS OF ANIMALS, MAN AND NATURAL PHENOMENA ON THE FOREST AND METHODS OF CONTROLLING THEM.

B. INSTRUCTIONAL AREAS

1. IDENTIFYING THE MAJOR FOREST DISEASES

   A. IDENTIFYING ROT-CAUSING FUNGI

      (1) CLASSIFYING FUNGI
      (2) IDENTIFYING SYMPTOMS AND SIGNS OF MAJOR FUNGI INFECTION
      (3) IDENTIFYING RUSTS

   B. IDENTIFYING FOLIAGE DISEASES

C. IDENTIFYING STEM DISEASES

D. IDENTIFYING ROOT DISEASES

2. DEVELOPING DISEASE PREVENTION AND CONTROL PROGRAMS

A. PREVENTING FOREST DISEASES

B. DETERMINING DISEASE CONTROL METHODS

(1) OPERATING AND ADJUSTING EQUIPMENT
(2) SELECTING AND APPLYING CHEMICALS

C. EVALUATING COSTS AND EFFECTIVENESS

3. DETERMINING THE ROLE OF INSECTS IN THE FOREST

A. DETERMINING IMPORTANCE OF FOREST INSECTS

B. IDENTIFYING BENEFICIAL INSECTS

C. IDENTIFYING DESTRUCTIVE INSECTS

(1) IDENTIFYING CONIFER AND HARDWOOD DEFOLIATORS
(2) IDENTIFYING TIP, CAMBIUM, HEARTWOOD AND ROOT FEEDERS
(3) IDENTIFYING SAP FEEDERS
(4) IDENTIFYING SEED DESTROYERS
(5) IDENTIFYING DISEASE VECTORS

D. IDENTIFYING FOREST INSECT DAMAGE

4. SELECTING INSECT CONTROL MEASURES

A. DETERMINING DIRECT CONTROL METHODS

(1) USING MECHANICAL METHODS

(A) OPERATING TOOLS AND EQUIPMENT
(B) MAINTAINING TOOLS AND EQUIPMENT

(2) USING CHEMICAL METHODS

(A) SELECTING CHEMICALS
(B) MAKING FORMULATIONS
(C) APPLYING CHEMICALS
(D) OPERATING AND MAINTAINING EQUIPMENT
(E) PRACTICING SAFETY WITH CHEMICALS

B. DETERMINING INDIRECT CONTROL METHODS

(1) USING SILVICULTURAL PRACTICES
(2) USING INDIRECT BIOLOGICAL AND CHEMICAL CONTROLS

C. EVALUATING COSTS AND EFFECTIVENESS

D. DETERMINING FOREST INSECT LEGISLATION AND CONTROL REGULATIONS

5. IDENTIFYING OTHER DESTRUCTIVE AGENTS

A. DETERMINING THE EFFECTS OF FOREST ANIMALS

B. DETERMINING THE EFFECTS OF MAN

C. DETERMINING THE EFFECTS OF NATURAL PHENOMENA

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. MAKE FIELD DISSECTIONS OF TREES WITH A CHAIN SAW TO SHOW VISIBLE SIGNS AND SYMPTOMS OF DECAY.

2. HAVE THE STUDENTS DEVELOP A DISEASE PREVENTION PLAN FOR A GIVEN FORESTED AREA.

3. LOCATE, CAPTURE AND IDENTIFY FOREST INSECT PESTS AND PREPARE THEM FOR EXHIBIT.

4. OBSERVE AND/OR ASSIST IN MECHANICALLY OR CHEMICALLY CONTROLLING INSECTS ON A FOREST PLANTATION WHERE SUCH PROCEDURES ARE IN PROGRESS.

5. TAKE FIELD TRIPS TO FOREST PLANTATIONS EXHIBITING PROTECTIVE MEASURES TO PREVENT DAMAGE BY INSECTS, DISEASES, MAN, ANIMALS AND/OR CLIMATIC FACTORS.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE THE STUDENTS IDENTIFY THE MAJOR FOREST DISEASES AND/OR THEIR SYMPTOMS FROM SPECIMENS, SLIDES OR PICTURES.

2. HAVE THE STUDENTS DEVELOP A PLAN TO PREVENT AND CONTROL DISEASES ON A GIVEN FORESTED AREA. EVALUATE THE PLANS AS TO FEASIBILITY AND COMPLETENESS.

3. DEVELOP A PRACTICAL EXAMINATION USING SPECIMENS, SLIDES OR PICTURES OF THE EIGHT MAJOR FOREST INSECTS IN THE REGION. HAVE THE STUDENTS IDENTIFY THE INSECTS AND DESCRIBE THE DAMAGE THEY CAUSE.

4. ON A GIVEN FOREST PLOT WITH INSECT INFESTATION, HAVE THE STUDENTS PERFORM MECHANICAL AND/OR CHEMICAL MEASURES WHICH WILL HELP CONTROL INSECT DAMAGE. EVALUATE THE STUDENTS IN RELATION TO THEIR CORRECT USE AND MAINTENANCE OF EQUIPMENT AND USE OF APPROPRIATE PROCEDURES.

5. HAVE THE STUDENTS LIST THE DESTRUCTIVE AGENTS TO A FOREST OTHER THAN INSECTS AND DISEASE AND INDICATE HOW THEIR EFFECTS CAN BE MINIMIZED.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. HARD HATS
2. NONPOISONOUS KILLING JARS
3. INSECT NET
4. INSECT SPREADING BOARD
5. INSECT RELAXING BOX
6. INSECT EXHIBIT CASE
7. CHAIN SAWS
8. PRUNING EQUIPMENT
9. CHEMICAL SPRAYERS

F. EXAMPLES OF SUPPORTING REFERENCES

1. ALLEN, SHIRLEY W. AND SHARPE, GRANT W. AN INTRODUCTION TO AMERICAN FORESTRY. NEW YORK, NEW YORK: MC GRAW-HILL BOOK COMPANY. 1960, 468 PAGES.

   CHAPTERS NINE AND TEN OF THIS TEXT CONSIDER THE MAJOR FOREST INSECTS AND DISEASES AND METHODS OF CONTROL.

2. ANDERSON, R. F. FOREST AND SHADE TREE ENTOMOLOGY. NEW YORK, NEW YORK: JOHN WILEY AND SONS, INC. 1960.

   THIS BOOK PROVIDES IDENTIFICATION, SYMPTOMS OF DAMAGE AND CONTROL MEASURES FOR MAJOR FOREST INSECTS.

3. MANAGING THE FAMILY FOREST. BULLETIN NO. F 2187. WASHINGTON, D.C.: U.S. DEPARTMENT OF AGRICULTURE, U.S. GOVERNMENT PRINTING OFFICE. 1962, 61 PAGES.

   IN THIS BULLETIN, GENERAL INFORMATION IS GIVEN CONCERNING THE MAJOR FOREST INSECTS AND DISEASES WHICH OCCUR IN HARDWOOD AND SOFTWOOD FORESTS.

FIRE PREVENTION AND CONTROL

UNIT CONCEPT: EACH YEAR, VALUABLE TIMBER RESOURCES, RECREATIONAL AREAS AND WILDLIFE HABITATS ARE DESTROYED BY FIRE. THE USE OF PROPER METHODS OF PREVENTING, DETECTING AND SUPPRESSING FOREST FIRES WILL HELP MINIMIZE THESE LOSSES.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. DETERMINE THE BEHAVIOR OF FIRE BY DEFINING AND DESCRIBING THE TERMS:

   A. FIRE TRIANGLE,

   B. RADIATION,

   C. CONVECTION,

   D. CONDUCTION, AND

   E. IGNITION TEMPERATURE.

2. PERFORM FIRE PREVENTION PROCEDURES SUCH AS COMPUTING AND REPORTING THE FIRE DANGER INDEX AND REDUCING FOREST FIRE HAZARDS WITH ACCURACY REQUIRED OF A FORESTRY AIDE.

3. USE THE OSBORN FIRE-FINDER IN A GIVEN SITUATION TO STATE IN DEGREES AND MINUTES THE DIRECTION OF A HYPOTHETICAL "SMOKE" AND TO REPORT SAME TO WITHIN 30 MINUTES USING THE VERNIER SCALE.

4. WHEN GIVEN TWO AZIMUTH READINGS AND TOWER LOCATIONS, LOCATE THE POSITION OF A "SMOKE" ON A TOPOGRAPHIC MAP TO WITHIN 1/4 MILE.

5. WHEN GIVEN A SPECIFIED FIRE CONDITION, IMPLEMENT THE ACTION REQUIRED TO SUPPRESS THE FIRE AND CONTROL IT INCLUDING SAFELY OPERATING FIRE FIGHTING TOOLS AND EQUIPMENT.

6. MAINTAIN FIRE SUPPRESSION TOOLS AND EQUIPMENT WITH COMPETENCY REQUIRED OF A FORESTRY AIDE.

B. INSTRUCTIONAL AREAS

1. DETERMINING FIRE BEHAVIOR

   A. IDENTIFYING THE ELEMENTS OF THE FIRE TRIANGLE

      (1) DETERMINING THE IMPORTANCE OF FUEL

         (A) FUEL SIZE
         (B) FUEL ARRANGEMENT
         (C) FUEL VOLUME

      (2) DETERMINING THE IMPORTANCE OF OXYGEN

         (A) EFFECTS OF WIND
         (B) EFFECTS OF TEMPERATURE
         (C) EFFECTS OF HUMIDITY

      (3) DETERMINING THE IMPORTANCE OF HEAT

         (A) DETERMINING IGNITION TEMPERATURE
         (B) IDENTIFYING SOURCES OF HEAT
         (C) IDENTIFYING METHODS OF HEAT TRANSFER - RADIATION, CONVECTION, CONDUCTION

   B. DETERMINING THE EFFECTS OF TOPOGRAPHY ON FIRE BEHAVIOR

2. IMPLEMENTING FIRE PREVENTION

   A. USING THE FIRE DANGER RATING

      (1) IDENTIFYING THE CONDITION OF LESSER VEGETATION
      (2) COMPUTING THE BUILD-UP INDEX
      (3) COMPUTING THE BURNING INDEX
      (4) DETERMINING WIND VELOCITY
      (5) DETERMINING FUEL MOISTURE

   B. IDENTIFYING HIGH RISK AREAS

      (1) DETERMINING MAJOR CAUSES OF FIRE
      (2) DETERMINING FREQUENCY OF OCCURRENCES
      (3) DETERMINING WHEN, WHERE AND WHY FIRES OCCUR

   C. REDUCING FIRE HAZARDS

      (1) BUILDING FIRE BREAKS
      (2) REDUCING FUEL IN THE AREA
      (3) OPERATION AND MAINTENANCE OF TOOLS AND EQUIPMENT

   D. USING PROGRAMS AND CAMPAIGNS TO INFLUENCE PEOPLE TOWARD FIRE PREVENTION

3. DEVELOPING PRESUPPRESSION MEASURES

   A. LOCATING SMALL FIRES

      (1) PATROLLING FROM THE AIR
      (2) PATROLLING ON THE GROUND
      (3) READING A TOPOGRAPHICAL MAP
      (4) USING THE HAND COMPASS

   B. USING THE FIRE FINDER

      (1) BECOMING ACQUAINTED WITH THE COUNTRY
      (2) LOCATING AND IDENTIFYING SMOKE

         (A) USING THE SYSTEMATIC SCAN METHOD
         (B) KEEPING TOWER RECORDS

      (3) DETERMINING SMOKE LOCATION

         (A) LEVELING AND CARING FOR THE FIRE FINDER
         (B) ORIENTING THE FIRE FINDER MAP DISC
         (C) MEASURING AND USING ANGLES
         (D) USING THE INTERSECT METHOD OF FIXING
         (E) REPORTING THE SMOKE

   C. USING RADIOS FOR COMMUNICATION

4. DEVELOPING FIRE SUPPRESSION MEASURES

   A. SELECTING THE CONTROL TACTICS

      (1) USING DIRECT CONTROL
      (2) USING INDIRECT CONTROL

   B. ORGANIZING THE LINE CREW

   C. BUILDING THE FIRE LINE

      (1) USING THE ONE-LICK METHOD
      (2) USING THE PROGRESSIVE METHOD
      (3) USING THE ROTARY METHOD

   D. USING THE HAND TOOLS AND EQUIPMENT PROPERLY

   E. EMPLOYING HEAVY EQUIPMENT

   F. APPLYING WATER

   G. USING FIRE RETARDANTS

      (1) SELECTING THE TYPE OF RETARDANT
      (2) SELECTING THE METHOD OF APPLICATION

H. BACK-FIRING

I. PLOWING OUT

5. MAINTAINING TOOLS AND EQUIPMENT

A. REPLACING HANDLES

B. SHARPENING HEADS

C. PREVENTING RUST

D. CARING FOR BACK PACK PUMPS

E. MAINTAINING FIRE HOSE

F. MAINTAINING RADIOS

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. HAVE THE STUDENTS DEMONSTRATE THE FACTORS IN THE FIRE TRIANGLE (FUEL, OXYGEN, HEAT) BY COMBINING THEM IN A CONTROLLED SITUATION. FOR EXAMPLE, INSERT A GLOWING WOODEN STICK INTO A TEST TUBE OF OXYGEN.

2. A. TAKE A FIELD TRIP TO A FORESTED AREA AND IDENTIFY NATURAL AND MAN-MADE FIRE RISKS.

   B. SET UP A WEATHER STATION, TAKE READINGS AND COMPUTE THE FIRE DANGER INDEX.

3. TAKE FIELD TRIPS TO LOCAL, STATE AND/OR FEDERAL FORESTS TO OBSERVE THE USE OF FIRE FINDERS TO LOCATE SMOKE OR FIRES.

4. HAVE THE STUDENTS LOCATE A HYPOTHETICAL "SMOKE" ON A TOPOGRAPHICAL MAP OF THE AREA AND LOCATE THE SAME POSITION ON THE GROUND WHEN GIVEN INFORMATION WHICH WOULD BE AVAILABLE FROM FIRE TOWERS.

5. HAVE PARK MANAGERS, FOREST RANGERS OR FIRE CREW LEADERS DISCUSS FIRE FIGHTING TECHNIQUES AND PROPER EQUIPMENT USE WITH THE STUDENTS.

6. HAVE THE STUDENTS SHARPEN AND REPLACE HANDLES ON FIRE FIGHTING TOOLS.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. DEVELOP A MATCHING TEST IN WHICH THE STUDENTS ARE TO MATCH THE TERMS WHICH ARE USED IN DESCRIBING FIRE

BEHAVIOR WITH THEIR DEFINITIONS.

2. HAVE THE STUDENTS COMPUTE THE FIRE DANGER INDEX FOR A SPECIFIED FOREST AREA WHEN GIVEN THE NECESSARY WEATHER AND FOREST DATA.

3. USING A FIRE FINDER, HAVE EACH STUDENT STATE IN DEGREES AND MINUTES THE DIRECTION OF A HYPOTHETICAL "SMOKE" WITHIN 30 MINUTES.

4. GIVE EACH STUDENT A TOPOGRAPHICAL MAP AND AZIMUTH READINGS AND TOWER READINGS OF A NUMBER OF HYPOTHETICAL SMOKE LOCATIONS. HAVE EACH STUDENT DETERMINE THE LOCATIONS ON THE MAP WITH ACCURACY TO WITHIN 1/4 MILE.

5. HAVE THE GROUP OF STUDENTS CONSTRUCT A FIRE LINE BETWEEN TWO POINTS. EVALUATE THE STUDENTS AS TO SPEED, ABILITY TO EFFECTIVELY USE TOOLS AND EQUIPMENT AND WILLINGNESS TO WORK COOPERATIVELY.

6. HAVE EACH STUDENT SHARPEN OR REPLACE A HANDLE ON A FIRE SUPPRESSION TOOL SUCH AS AN AX, SHOVEL, PULASKI OR RAKE.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. HARD HATS
2. CHAIN SAWS
3. BACK PACK PUMPS
4. SHOVELS
5. FIRE RAKES
6. FIRE SWATTERS
7. AXES

F. EXAMPLES OF SUPPORTING REFERENCES

1. BROWN, ARTHUR A. AND DAVIS, KENNETH P. FOREST FIRE: CONTROL AND USE. NEW YORK, NEW YORK: MC GRAW-HILL BOOK COMPANY. 1973, 686 PAGES.

THIS REFERENCE GIVES A COMPLETE DISCUSSION OF FOREST FIRE PREVENTION, PRE-SUPPESSION AND SUPPRESSION PROCEDURES.

2. FIREMAN'S HANDBOOK. WASHINGTON, D.C.: U.S. DEPARTMENT OF AGRICULTURE, U.S. GOVERNMENT PRINTING OFFICE. 1971, 61 PAGES.

THIS HANDBOOK PROVIDES SPECIFIC INFORMATION CONCERNING SAFETY PROCEDURES AND TOOL AND EQUIPMENT OPERATION FOR SUPPRESSING FOREST FIRES.

TIMBER MANAGEMENT PRACTICES

UNIT CONCEPT: THE USE OF APPROPRIATE TIMBER MANAGEMENT PRACTICES WHICH INCLUDES IMPLEMENTING TIMBER STAND IMPROVEMENT WHEN ECONOMICALLY FEASIBLE AND DEVELOPING SOUND HARVESTING SYSTEMS WILL INCREASE THE QUALITY AND VALUE OF TIMBER AS WELL AS PROTECT THE FOREST SITE.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. PRESCRIBE FOR A SPECIFIC FOREST PRODUCT ON A GIVEN PLANTATION OF ANY AGE THE TIMING, METHOD AND INTENSITY OF THE NEXT WEEDING, THINNING AND PRUNING.

2. WHEN GIVEN A FOREST AREA AND TIMBER STAND IMPROVEMENT PRACTICES TO BE IMPLEMENTED, COMPLETE THE PRESCRIBED PRACTICES WITH COMPETENCE REQUIRED TO OBTAIN THE DESIRED RESULTS.

3. IDENTIFY AND IMPLEMENT THE DIFFERENT TYPES OF HARVEST CUTTINGS THAT ARE USED IN EVEN-AGED AND UNEVEN-AGED FORESTS IN HIS AREA WITH COMPLETE ACCURACY.

4. IDENTIFY THE DIFFERENT GOVERNMENT AND PROFESSIONAL FOREST MANAGEMENT ORGANIZATIONS AND EXPLAIN THE SERVICES THEY PROVIDE FOREST LANDOWNERS.

B. INSTRUCTIONAL AREAS

1. SELECTING TIMBER STAND IMPROVEMENT PRACTICES

   A. ANALYZING THE FOREST

      (1) DETERMINING FOREST CONDITION
      (2) DETERMINING FOREST COMPOSITION
      (3) DETERMINING FOREST AGE AND GROWTH

   B. IDENTIFYING MANAGEMENT GOALS

2. IMPLEMENTING TIMBER STAND IMPROVEMENT PRACTICES

   A. WEEDING A FOREST PLANTATION

      (1) USING MECHANICAL METHODS

(A) OPERATING THE EQUIPMENT
(B) MAINTAINING THE EQUIPMENT

(2) USING CHEMICAL METHODS

(A) SELECTING CHEMICALS
(B) OPERATING THE EQUIPMENT
(C) MAINTAINING THE EQUIPMENT

B. THINNING A FOREST PLANTATION

(1) DETERMINING THE METHOD OF THINNING

(A) USING THE SELECTION SYSTEM
(B) USING ROW THINNING

(2) OPERATING AND MAINTAINING THE EQUIPMENT

C. MAKING PRE-COMMERCIAL AND SUBSEQUENT THINNINGS

(1) MAKING RELEASE (LIBERATION) CUTTINGS
(2) MAKING IMPROVEMENT CUTTINGS
(3) SELECTING AND APPLYING CHEMICALS
(4) OPERATING AND MAINTAINING EQUIPMENT

D. PRUNING THE FOREST PLANTATION

(1) DETERMINING THE BEST SEASON FOR PRUNING
(2) DETERMINING AGE OF THE STAND AND AMOUNT OF PRUNING REQUIRED
(3) OPERATING AND MAINTAINING THE EQUIPMENT

3. IDENTIFYING TYPES OF HARVEST CUTTINGS

A. IDENTIFYING TYPES OF CUTTINGS USED IN EVEN-AGED FORESTS

(1) CLEAR CUTTING
(2) SEED-TREE CUTTING
(3) SHELTERWOOD CUTTING
(4) OTHER

B. IDENTIFYING TYPES OF CUTTINGS USED IN UNEVEN-AGED FORESTS

(1) SELECTIVE CUTTING
(2) DIAMETER LIMIT CUTTING
(3) OTHER

4. IDENTIFYING ADVANTAGES AND DISADVANTAGES OF EACH TYPE OF HARVEST CUTTING

A. EASE OF LOGGING OPERATION

B. INCOME PRODUCED

C. EFFECT ON SOIL, WATER AND WILDLIFE

D. EFFECT ON FOREST REGENERATION

5. IDENTIFYING FOREST MANAGEMENT SERVICES

A. DETERMINING FEDERAL, STATE AND COUNTY GOVERNMENT AGENCIES AND SERVICES

B. DETERMINING PROFESSIONAL AND PRIVATE CONSERVATION ORGANIZATIONS AND SERVICES

C. IDENTIFYING FOREST RESEARCH ORGANIZATIONS AND SERVICES

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. HAVE STUDENTS RECOMMEND TIMBER STAND IMPROVEMENT PRACTICES ON A GIVEN STAND OF TIMBER AND BE ABLE TO DEFEND THEIR RECOMMENDATIONS.

2. A. HAVE THE STUDENTS DEMONSTRATE SAFE EQUIPMENT OPERATION WHILE IMPLEMENTING APPROPRIATE TIMBER STAND IMPROVEMENT PRACTICES ON THE SCHOOL FOREST OR ON A COOPERATOR'S WOODLOT.

   B. USE AN INCREMENT BORER TO SHOW THE EFFECTS OF TIMBER STAND IMPROVEMENT PRACTICES ON THE GROWTH RATE OF TREES.

3. HAVE THE STUDENTS VISIT FOREST AREAS THAT HAVE BEEN HARVESTED TO OBSERVE THE TYPE OF HARVEST CUTTING USED AND ITS EFFECTS ON THE SOIL, WATER, WILDLIFE AND REMAINING FOREST.

4. A. HAVE REPRESENTATIVES OF DIFFERENT FOREST ORGANIZATIONS AS RESOURCE PERSONS TO DISCUSS THEIR PROGRAMS AND SERVICES.

   B. TAKE A FIELD TRIP TO A FOREST EXPERIMENT STATION OR RESEARCH LABORATORY.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE EACH STUDENT DETERMINE THE TIMBER STAND IMPROVEMENT PRACTICES NEEDED ON A GIVEN WOODLOT OR PLANTATION. HAVE

A SERVICE FORESTER OR FOREST INDUSTRY EMPLOYEE ASSIST IN THE EVALUATION OF THE STUDENT'S RECOMMENDATIONS AND INDICATE HIS OBSERVATIONS CONCERNING NEEDED TIMBER STAND IMPROVEMENT.

2. HAVE EACH STUDENT DEMONSTRATE HIS ABILITY TO OPERATE AND MAINTAIN TOOLS AND EQUIPMENT USED IN TIMBER STAND IMPROVEMENT. THE EVALUATION SHOULD INCLUDE CORRECTNESS OF EQUIPMENT OPERATION AND MAINTENANCE AS WELL AS OBSERVANCE OF SAFETY PRECAUTIONS.

3. HAVE EACH STUDENT DEFINE EACH HARVEST CUTTING METHOD AND LIST THEIR ADVANTAGES AND DISADVANTAGES.

4. HAVE EACH STUDENT LIST SIX FOREST MANAGEMENT ORGANIZATIONS AND DESCRIBE THE SERVICES THEY PROVIDE.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. HARD HATS
2. CHAIN SAWS
3. TREE INCREMENT BORER
4. PRUNING EQUIPMENT
5. PAINT (MARKING) GUNS
6. TREE INJECTORS
7. CHEMICAL SPRAYERS

F. EXAMPLES OF SUPPORTING REFERENCES

1. MANAGEMENT OF FOREST RESOURCES FOR MULTIPLE USE. UNIVERSITY PARK, PENNSYLVANIA: DEPARTMENT OF AGRICULTURAL EDUCATION, THE PENNSYLVANIA STATE UNIVERSITY. 1970, 124 PAGES.

   THE STUDENT GUIDE PRESENTS GENERAL INFORMATION CONCERNING HARVEST CUTTING METHODS AND TIMBER STAND IMPROVEMENT. THE TEACHER'S GUIDE PROVIDES LEARNING ACTIVITIES AND STUDY QUESTIONS WHICH WOULD BE HELPFUL IN TEACHING THE UNIT.

2. MANAGING THE FAMILY FOREST. BULLETIN NO. F 2187. WASHINGTON, D.C.: U.S. DEPARTMENT OF AGRICULTURE, U.S. GOVERNMENT PRINTING OFFICE. 1962, 61 PAGES.

89/90

THIS PAMPHLET GIVES A GENERAL DESCRIPTION OF THE DIFFERENT HARVEST CUTTING METHODS AND TIMBER STAND IMPROVEMENT PRACTICES. IT WOULD BE APPROPRIATE FOR STUDENT USE.

IV

LOGGING - HARVESTING AND TRANSPORTING
U.S.O.E. CODE 01.07 03 00 00

FORESTRY SURVEYING AND LAND MEASUREMENT

FOREST MENSURATION

TIMBER SALES AND CONTRACTS

ESTABLISHING LOGGING ROADS, TRAILS AND LOG LANDINGS

FELLING, LIMBING AND BUCKING TREES WITH THE CHAIN SAW

SKIDDING LOGS OR BOLTS

LOADING, TRANSPORTING AND UNLOADING LOGS OR BOLTS

FOREST SURVEYING AND LAND MEASUREMENT

UNIT CONCEPT: SURVEYING AND LAND MEASUREMENT TECHNIQUES, WHICH INCLUDE PACING, CHAINING AND ESTABLISHING ANGLES, ARE ESSENTIAL FOR DETERMINING FOREST ACREAGES, SIZE OF SAMPLE PLOTS FOR CRUISING PURPOSES, AND FOR ESTABLISHING FOREST BOUNDARIES.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. IDENTIFY AND EXPLAIN THE TYPE OR TYPES OF LEGAL SURVEYS USED IN HIS STATE OR REGION WITH ACCURACY SPECIFIED BY THE INSTRUCTOR.

2. OBTAIN DISTANCE ON LEVEL GROUND (LESS THAN 2% SLOPE) BY PACING WITH LESS THAN 2% VARIATION IN 100 FEET AND BY CHAINING WITH A STEEL TAPE AND CHAINING PINS WITH AN ALLOWABLE ERROR OF .02%.

3. OBTAIN DISTANCE ON SLOPING GROUND (OVER 2%) BY PACING WITH LESS THAN 4% VARIATION AND BY BREAKING CHAIN USING A STEEL TAPE AND CHAINING PINS WITH AN ALLOWABLE ERROR OF ONE FOOT IN 500 FEET.

4. ESTABLISH PREDETERMINED ANGLES OR BEARINGS USING A TRANSIT OR A SURVEYOR'S STAFF COMPASS TO WITHIN ONE DEGREE.

5. RUN AN OPEN TRAVERSE AND A CLOSED TRAVERSE IN THE FIELD USING A TRANSIT AND ROD OR A STAFF COMPASS, STEEL TAPE AND CHAINING PINS WITH THE CLOSED TRAVERSE TO CLOSE WITHIN ONE FOOT IN 500 FEET OF DISTANCE.

6. DETERMINE THE LAND AREA, WITHIN ONE ACRE PER TWENTY ACRES, OF AREAS HAVING TRIANGULAR, RECTANGULAR, TRAPEZOIDAL, TRAPEZIUM OR CURVED BOUNDARIES USING LAND MEASUREMENTS AND SET FORMULAS.

B. INSTRUCTIONAL AREAS

1. IDENTIFYING TYPES OF PUBLIC LAND SURVEYS

   A. USING THE METES AND BOUNDS SYSTEM

   B. USING THE RECTANGULAR SYSTEM

   C. INTERPRETING DEEDS AND LEGAL DESCRIPTIONS

2. MAKING LINEAR MEASUREMENTS ON LEVEL GROUND

   A. PACING

   B. CHAINING

      (1) IDENTIFYING UNITS OF MEASURE
      (2) IDENTIFYING THE EQUIPMENT AND ITS PROPER USE
      (3) CARING FOR THE EQUIPMENT
      (4) RECORDING FIELD NOTES

3. MAKING LINEAR MEASUREMENTS ON SLOPING GROUND

   A. PACING

   B. BREAKING CHAIN

4. ESTABLISHING ANGLES AND BEARINGS WITH A TRANSIT OR STAFF COMPASS

   A. TRANSPORTING THE INSTRUMENT SAFELY

   B. SETTING UP THE INSTRUMENT

   C. READING THE COMPASS AND VERNIER

   D. ALLOWING FOR ANGLE OF DECLINATION

5. RUNNING OPEN AND CLOSED TRAVERSES

   A. ESTABLISHING ANGLES

   B. CHAINING

6. DETERMINING ACREAGE IN LAND AREAS

   A. MEASURING BOUNDARIES

   B. MAKING CALCULATIONS

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. HAVE THE STUDENTS DETERMINE THE TYPE OF LEGAL SURVEY USED IN THEIR STATE OR REGION AND PRACTICE LOCATING SPECIFIED SITES OR LAND AREAS FROM DEEDS OR LAND DESCRIPTIONS.

2. HAVE THE STUDENTS CHAIN A 100-FOOT DISTANCE ON LEVEL GROUND, DETERMINE THE NUMBER OF PACES NEEDED TO PACE THE DISTANCE, AND CALCULATE THE LENGTH OF EACH PACE.

3. HAVE THE STUDENTS CHAIN AND PACE A SPECIFIED DISTANCE ON SLOPING GROUND TO DETERMINE THE EFFECTS OF SLOPE ON LENGTH OF PACE.

4. TAKE A POINT ON A TOPOGRAPHIC MAP AND SELECT A DESTINATION POINT. ATTACH STRINGS FROM THE STARTING POINT ALONG A TRUE NORTH DIRECTION AND A MAGNETIC NORTH DIRECTION. HAVE STUDENTS CALCULATE THE DISTANCE BY WHICH THEY WOULD HAVE MISSED THE DESTINATION BY FOLLOWING THE MAGNETIC NORTH WITHOUT ALLOWING FOR ANGLE OF DECLINATION.

5. HAVE PAIRS OF STUDENTS RUN CLOSED TRAVERSES IN THE FIELD USING THE NECESSARY EQUIPMENT. HAVE A SOIL CONSERVATION SERVICE AIDE OR TECHNICIAN ASSIST IN INSTRUCTING THE STUDENTS, IF NECESSARY.

6. HAVE THE STUDENTS PRACTICE DETERMINING ACREAGES BY RUNNING CLOSED TRAVERSES AND CALCULATING THE ACREAGE FROM THE RESULTS.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE EACH STUDENT WRITE A DESCRIPTION OF THE BASIC TYPES OF LEGAL SURVEYS.

2. HAVE EACH STUDENT MEASURE DISTANCES BY PACING GROUND. EVALUATE THE STUDENTS BY CHAINING THE SAME DISTANCES WITH ACCURACY TO BE WITHIN LIMITS SET IN THE PERFORMANCE OBJECTIVES.

3. HAVE EACH STUDENT MEASURE DISTANCES BY PACING ON SLOPING GROUND. EVALUATION SHOULD BE IN ACCORDANCE WITH THE LIMITS SET IN THE PERFORMANCE OBJECTIVES.

4. HAVE EACH STUDENT ESTABLISH ANGLES USING A TRANSIT OR STAFF COMPASS WITH ACCURACY TO BE WITHIN ONE DEGREE OF THE SPECIFIED ANGLE.

5. HAVE PAIRS OF STUDENTS RUN A CLOSED TRAVERSE USING A TRANSIT OR STAFF COMPASS, STEEL TAPE AND CHAINING PINS WITH ACCURACY WITHIN ONE FOOT IN 500 FEET OF DISTANCE.

6. HAVE THE STUDENTS DETERMINE THE LAND AREA IN ACRES OF REGULARLY AND IRREGULARLY SHAPED LAND AREAS BY MAKING ALL NECESSARY MEASUREMENTS NEEDED FOR CALCULATION AND USING SET FORMULAS.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. TRANSIT AND ROD OR A STAFF COMPASS
2. STEEL TAPE AND CHAINING PINS OR GUNTER'S CHAIN
3. HAND COMPASS
4. FIELD NOTEBOOK
5. DEEDS OR LEGAL LAND DESCRIPTIONS

F. EXAMPLES OF SUPPORTING REFERENCES

1. CONSERVATION AIDE IV - SURVEYING. COLUMBUS, OHIO: OHIO AGRICULTURAL EDUCATION CURRICULUM MATERIALS SERVICE, THE OHIO STATE UNIVERSITY. 1972, 83 PAGES.

   THIS REFERENCE IS AN EXCELLENT AID FOR THE STUDENT AND TEACHER WITH INFORMATION CONCERNING TYPES OF LEGAL SURVEYS AND SPECIFIC SURVEYING METHODS.

2. SCHWAB, GLENN O., FREVERT, RICHARD K., BARNES, KENNETH K. AND EDMINSTER, TALCOTT W. ELEMENTARY SOIL AND WATER ENGINEERING. NEW YORK, NEW YORK: JOHN WILEY AND SONS, INC. 1965, 296 PAGES.

   THIS TEXT CONTAINS AN IN-DEPTH DISCUSSION OF LINEAR MEASUREMENT METHODS.

FOREST MENSURATION

UNIT CONCEPT: ACCURATE MEASUREMENT OF THE PRESENT VOLUME AND GROWTH RATE OF INDIVIDUAL TREES AND TREE STANDS WILL RESULT IN VALUABLE INFORMATION FOR FOREST HARVESTING AND MANAGEMENT.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. USE ONE OR MORE OF THE FOLLOWING MEASURES OF FOREST PRODUCTS TO DETERMINE THE VOLUME OF WOOD IN A SPECIFIED NUMBER OF LOGS OR BOLTS WITH ACCURACY REQUIRED OF A FORESTRY AIDE:

   A. LINEAR MEASUREMENT,

   B. CORDWOOD MEASUREMENT,

   C. CUBIC FOOT MEASUREMENT,

   D. BOARD FOOT, AND

   E. WEIGHT.

2. USING COMMON TREE MEASUREMENT INSTRUMENTS AND TREE VOLUME TABLES, DETERMINE THE VOLUME OF TIMBER IN A STANDING TREE WITHIN ± 3%.

3. USING TREE IDENTIFICATION KEYS AND AN INCREMENT BORER OR INCREMENT HAMMER, DETERMINE THE SPECIES, AGE AND/OR HISTORY OF A STANDING TREE WITH ACCURACY REQUIRED OF A FORESTRY AIDE.

4. WHEN GIVEN COMMONLY USED SURVEYING INSTRUMENTS, LOCATE AND ESTABLISH FOREST BOUNDARIES AND SAMPLE PLOTS WITH ACCURACY NEEDED TO PERFORM A TIMBER CRUISE.

5. IDENTIFY AND IMPLEMENT THE DIFFERENT METHODS OF CRUISING TIMBER WITH COMPETENCY REQUIRED OF A FOREST AIDE.

6. USING STATE OR REGIONAL PRICE DATA, ESTIMATE THE VALUE OF A GIVEN STAND OR TIMBER WITHIN ± 10%.

7. USING A SPRAYER OR BRUSH AND BUCKET, MARK TREES FOR HARVESTING USING MARKING TECHNIQUES ACCEPTED IN THE STATE OR REGION.

B. INSTRUCTIONAL AREAS

1. MEASURING FOREST PRODUCTS

A. USING BOARD FEET

(1) DETERMINING CIRCUMSTANCES OF USE
(2) USING FORMULAS TO CALCULATE BOARD FEET

B. USING CUBIC FEET

(1) DETERMINING CIRCUMSTANCES OF USE
(2) CALCULATING CUBIC FEET

C. USING THE CORD

(1) IDENTIFYING DIFFERENT TYPES OF CORD MEASUREMENT

(A) STANDARD
(B) SHORT
(C) LONG

(2) DETERMINING CIRCUMSTANCES OF USE
(3) CALCULATING CORDS

D. USING UNIT OR PIECE MEASURE

E. USING WEIGHT MEASURE

2. DETERMINING THE VOLUME OF TIMBER IN A STANDING TREE

A. DETERMINING THE DIAMETER BREAST HEIGHT (DBH)

B. DETERMINING THE NUMBER OF LOGS IN THE TREE

C. OBSERVING TREE DEFECTS OR DAMAGE

D. USING TREE VOLUME TABLES

(1) DOYLE
(2) INTERNATIONAL
(3) OTHER

3. DETERMINING THE SPECIES, HISTORY AND/OR AGE OF A TREE

A. IDENTIFYING TREE SPECIES

B. INTERPRETING ANNUAL RINGS

C. USING THE INCREMENT BORER OR HAMMER

4. ESTABLISHING FOREST BOUNDARIES AND LOCATION OF SAMPLE PLOTS

   A. IDENTIFYING CHARACTERISTICS OF METES AND BOUNDS AND RECTANGULAR SURVEY SYSTEMS

   B. OPERATING FOREST SURVEYING EQUIPMENT

      (1) STAFF COMPASS OR TRA[illegible]OD
      (2) CHAIN AND CHAINING [illegible]
      (3) ABNEY HAND LEVEL

   C. INTERPRETING MAPS AND AER[illegible]OTOGRAPHS

5. CRUISING TIMBER

   A. IMPLEMENTING THE DIFFERENT METHODS OF CRUISING TIMBER

      (1) MAKING A 100% OR TOTAL CRUISE
      (2) USING THE RANDOM SAMPLE METHOD
      (3) USING MECHANICAL SAMPLING METHODS

         (A) LINE-PLOT CRUISING
         (B) STRIP CRUISING

      (4) USING THE VARIABLE PLOT METHOD

         (A) USING A WEDGE PRISM
         (B) COMPUTING THE BASAL AREA IN SQUARE FEET PER ACRE

   B. MAKING A CONTINUOUS FOREST INVENTORY

      (1) LOCATING THE SAMPLE PLOT
      (2) COLLECTING DATA

6. ESTIMATING THE TIMBER VALUE OF A FOREST AREA

   A. READING TIMBER PRICE DATA

   B. CALCULATING TIMBER VALUE

7. MARKING TREES FOR HARVESTING

   A. USING CORRECT SYMBOLS

   B. SELECTING TREES FOR MARKING

   C. OPERATING AND MAINTAINING THE EQUIPMENT

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. GIVE THE STUDENTS MEASUREMENTS OF STANDING TREES, LOGS OR BOARDS AND HAVE THEM CALCULATE THE BOARD FEET, CUBIC FEET AND/OR LINEAR FEET IN THE MATERIAL.

2. ASSIGN THE STUDENTS A NUMBER OF TREES OR A PLOT IN A FORESTED AREA TO PRACTICE DETERMINING THE VOLUME OF WOOD PRESENT.

3. HAVE THE SERVICE FORESTER OR A FOREST INDUSTRY REPRESENTATIVE ASSIST THE STUDENTS IN IDENTIFYING TREE SPECIES, USING THE INCREMENT BORER AND INTERPRETING CORES TAKEN FROM TREES.

4. TAKE A FIELD TRIP TO A FORESTED AREA THAT IS BEING SURVEYED TO ESTABLISH LEGAL FOREST BOUNDARIES AND/OR TO LOCATE SAMPLE PLOTS FOR CRUISING. HAVE THE STUDENTS OBSERVE THE PROCEDURES AND ASSIST, IF POSSIBLE.

5. HAVE THE STUDENTS PERFORM A TOTAL CRUISE ON A GIVEN FOREST PLOT TO DEVELOP ABILITIES IN IDENTIFYING TREES, DETERMINING TREE VOLUMES AND READING VOLUME TABLES.

6. FROM THE CRUISE MADE IN LEARNING ACTIVITY 5, HAVE THE STUDENTS COMPUTE THE VALUE OF THE TIMBER USING REGIONAL PRICE DATA.

7. USE THE SERVICE FORESTER AS A RESOURCE PERSON TO DEMONSTRATE THE PROPER METHODS AND SYMBOLS TO USE IN MARKING TREES FOR HARVESTING.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. GIVE THE STUDENTS MEASUREMENTS OF STANDING TREES, LOGS OR BOARDS TO CALCULATE THE VOLUME IN BOARD FEET OR CUBIC FEET.

2. ASSIGN THE STUDENTS 10 TO 15 TREES TO DETERMINE THE VOLUME, USING A CRUISER STICK AND TREE VOLUME TABLES. THE STUDENT SHOULD BE ACCURATE WITHIN ± 10%.

3. HAVE THE STUDENTS INTERPRET THE RINGS FROM A CORE TAKEN FROM A TREE WITH AN INCREMENT BORER. THE STUDENTS SHOULD INDICATE THE TREE'S AGE AND ANY MAJOR HISTORICAL FEATURES THAT COULD BE OBSERVED ON THE CORE.

4. DIVIDE THE STUDENTS IN PAIRS. HAVE EACH PAIR OF STUDENTS ESTABLISH THE BOUNDARIES OF A SAMPLE PLOT IN A FORESTED AREA USING THE NECESSARY SURVEYING EQUIPMENT. EVALUATE

THE STUDENTS ON ACCURACY AND CORRECTNESS OF PROCEDURE. OBTAIN AID IN EVALUATION FROM A SERVICE FORESTER, FOREST INDUSTRY REPRESENTATIVE OR SOIL CONSERVATION SERVICE REPRESENTATIVE, IF NECESSARY.

5. HAVE THE CLASS CRUISE A FORESTED AREA USING ONE OF THE BASIC METHODS. EVALUATE EACH STUDENT ON HIS CORRECTNESS OF PROCEDURE, ACCURACY AND COOPERATION. THE ACCURACY OF THE CRUISE CAN BE CHECKED IF THE AREA HAS RECENTLY BEEN OFFICIALLY CRUISED.

6. HAVE EACH STUDENT CALCULATE THE TOTAL VALUE OF A FORESTED AREA WHEN GIVEN THE RESULTS OF A TIMBER CRUISE AND REGIONAL PRICE DATA.

7. HAVE EACH STUDENT LIST THE DIFFERENT MARKS OR SYMBOLS USED FOR MARKING TREES AND EXPLAIN THEIR MEANINGS.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. HARD HATS
2. CRUISER STICKS
3. STAFF COMPASS OR TRANSIT AND ROD
4. ABNEY LEVEL
5. STEEL TAPE AND CHAINING PINS
6. INCREMENT BORER AND/OR HAMMER
7. TIMBER VOLUME TABLES
8. REGIONAL TIMBER PRICE DATA
9. TREE IDENTIFICATION KEYS
10. TALLY SHEETS
11. PAINT SPRAYER OR BUCKET AND BRUSH
12. TREE DIAMETER TAPES AND/OR CALIPERS

F. EXAMPLES OF SUPPORTING REFERENCES

1. ALLEN, SHIRLEY W. AND SHARPE, GRANT W. AN INTRODUCTION TO AMERICAN FORESTRY. NEW YORK, NEW YORK: MC GRAW-HILL BOOK COMPANY. 1960, 466 PAGES.

CHAPTER ELEVEN OF THIS TEXT CONTAINS AN OVERVIEW OF THE ENTIRE PROCESS OF FOREST MENSURATION.

2. HARVESTING FORESTRY PRODUCTS. KIRBYVILLE, TEXAS: VOCATIONAL INSTRUCTIONAL SERVICES, TEXAS STATE DEPARTMENT OF EDUCATION. 1971, 200 PAGES.

   THIS TEACHER'S GUIDE CONTAINS USEFUL TRANSPARENCIES AND INFORMATION CONCERNING FOREST MENSURATION. IT ALSO INCLUDES SOME SUGGESTED REFERENCES.

TIMBER SALES AND CONTRACTS

UNIT CONCEPT: A WORKING KNOWLEDGE OF THE FACTORS INVOLVED IN THE PURCHASE AND/OR SALE OF TIMBER, SUCH AS, MARKET DEMAND, MARKETING METHODS, BIDS AND CONTRACTS, WILL MAXIMIZE THE UTILIZATION OF THE TIMBER AS WELL AS HELPING TO DETERMINE THE PROFIT THAT WILL BE REALIZED BY ALL PARTIES INVOLVED.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. DETERMINE THE MARKET DEMAND FOR DIFFERENT TYPES OF TIMBER PRODUCTS, SUCH AS, SAW TIMBER, PULPWOOD AND POLES, IN THE AREA OR REGION.

2. IDENTIFY AND EXPLAIN THE DIFFERENT METHODS OF MARKETING FOREST PRODUCTS, SUCH AS, STUMPAGE, AT THE ROAD SIDE OR AT THE MILL, AND THE ADVANTAGES AND DISADVANTAGES OF EACH METHOD.

3. WHEN GIVEN A SPECIFIED TYPE, SIZE AND QUALITY OF TIMBER, SELECT THE MARKET WHICH WILL YIELD THE HIGHEST RETURNS AND THE BEST METHOD OF MARKETING THE PRODUCT BY PREPARING A BUDGET OF ESTIMATED COSTS, GROSS RETURNS, NET RETURNS AND LABOR AND MANAGEMENT INCOME.

4. IDENTIFY THE ADVANTAGES AND DISADVANTAGES OF BUYING OR SELLING TIMBER USING THE DOYLE AND INTERNATIONAL TREE SCALES OR LOG RULES OR OTHER RULES COMMON TO THE AREA OR REGION.

5. IDENTIFY AND EXPLAIN THE COMMON METHODS OF OBTAINING OR PRESENTING BIDS FOR SELLING OR BUYING TIMBER AND PRESENT A BID FOR A TRACT OF TIMBER THAT IS WITHIN ± 10% OF A TIMBER BUYER'S BID.

6. DEVELOP A TIMBER SALES CONTRACT WHICH WILL MEET FOREST SERVICE GUIDELINES, WHEN GIVEN THE METHOD OF MARKETING THE TIMBER, THE SIZE OF THE AREA, THE RESULTS OF A CRUISE, THE COMPOSITION OF THE TIMBER, AND METHOD OF DISPOSING BY-PRODUCTS.

B. INSTRUCTIONAL AREAS

1. DETERMINING THE MARKET DEMAND FOR TIMBER PRODUCTS

A. IDENTIFYING TIMBER PRODUCTS

B. DETERMINING DEMANDS FOR TIMBER PRODUCTS

2. IDENTIFYING METHODS OF MARKETING FOREST PRODUCTS

A. IDENTIFYING METHODS OF MARKETING AT THE FOREST LOCATION

B. IDENTIFYING METHODS OF MARKETING AT THE MILL

C. DETERMINING ADVANTAGES AND DISADVANTAGES OF EACH METHOD

3. PREPARING A HARVESTING BUDGET

A. ESTIMATING COSTS OF POSSIBLE HARVESTING METHODS

B. ESTIMATING GROSS RETURNS

C. CALCULATING NET RETURNS

D. CALCULATING LABOR AND MANAGEMENT INCOME

4. SELECTING TREE SCALES AND/OR LOG RULES TO BE USED

A. IDENTIFYING ADVANTAGES AND DISADVANTAGES OF THE DOYLE RULE

B. IDENTIFYING ADVANTAGES AND DISADVANTAGES OF THE INTERNATIONAL RULE

C. IDENTIFYING OTHER RULES THAT MAY BE USED

5. BIDDING FOR TIMBER

A. IDENTIFYING THE CRITERIA FOR PRESENTING BIDS

B. IDENTIFYING THE TYPES OF BIDS

(1) USING DIRECT NEGOTIATION
(2) PRESENTING SEALED BIDS
(3) USING AUCTION BIDS

6. DEVELOPING TIMBER SALES CONTRACTS

A. GETTING THE AGREEMENT IN WRITING

B. IDENTIFYING ALL FACTORS TO BE INCLUDED

C. MAKING THE CONTRACT LEGAL AND BINDING

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. HAVE THE STUDENTS INVENTORY THE TYPES OF FOREST PRODUCTS INDUSTRIES IN THE IMMEDIATE AREA TO DETERMINE THE MARKETS FOR FOREST PRODUCTS AND THE LATEST PRICES FOR EACH PRODUCT.

2. ON A GIVEN ACRE OF FOREST LAND, HAVE THE STUDENTS INDICATE THE AMOUNT OF TIMBER THAT WOULD BE HARVESTED USING EACH OF THE DIFFERENT METHODS OF SELLING STUMPAGE. DISCUSS THE EFFECTS ON THE REMAINING FOREST OF EACH CUTTING METHOD.

3. USE THE INVENTORY RESULTS TO PREPARE A BUDGET FOR A SPECIFIC FOREST AREA THAT THE STUDENTS HAVE CRUISED. HAVE STUDENTS DETERMINE THE OPPORTUNITY COSTS CONSIDERING EACH METHOD OF MARKETING THE PRODUCT AND EACH ALTERNATIVE MARKET FOR THE PRODUCTS.

4. HAVE THE STUDENTS CRUISE A DESIGNATED FOREST AREA AND COMPARE THE RESULTS WHEN USING THE DOYLE, INTERNATIONAL OR OTHER COMMONLY USED RULES. USE FOREST SERVICE PRICE SHEETS TO DETERMINE DIFFERENCES IN VALUE OF THE TIMBER WHEN USING EACH RULE.

5. A. HAVE A FOREST INDUSTRY REPRESENTATIVE DISCUSS WITH THE STUDENTS METHODS OR TECHNIQUES OF PRESENTING BIDS AND OBTAINING CONTRACTS.

   B. HAVE A TIMBER BUYER ASSIST THE STUDENTS IN EVALUATING A TRACT OF TIMBER AND PREPARING A BID FOR IT. HAVE THE STUDENTS COMPARE THEIR BIDS TO THE TIMBER BUYER'S BID.

6. HAVE A SERVICE FORESTER ASSIST THE STUDENTS IN DEVELOPING AN APPROVED FORM THAT COULD BE USED AS A CONTRACT FOR SPECIFIC TIMBER TRANSACTIONS IN THE AREA OR REGION.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE EACH STUDENT DESCRIBE THE MARKET DEMAND FOR EACH FOREST PRODUCT IN HIS REGION.

2. HAVE EACH STUDENT LIST THE DIFFERENT METHODS OF MARKETING FOREST PRODUCTS AND ONE ADVANTAGE AND ONE DISADVANTAGE OF EACH.

3. HAVE EACH STUDENT PREPARE A BUDGET THAT WILL INDICATE THE LABOR AND MANAGEMENT INCOME FROM THE DIFFERENT METHODS OF MARKETING FOREST PRODUCTS AND, USING THE INFORMATION, SELECT THE BEST METHOD OF MARKETING A PARTICULAR TRACT OF TIMBER.

4. HAVE EACH STUDENT LIST THE ADVANTAGES AND DISADVANTAGES OF USING EACH OF THE DIFFERENT TREE SCALES AND LOG RULES USED IN HIS REGION.

5. HAVE EACH STUDENT PREPARE A BID SUITABLE FOR PRESENTATION TO A TIMBER SELLER FOR A GIVEN TRACT OF TIMBER WHICH IS WITHIN ± 10% OF A TIMBER BUYER'S BID.

6. HAVE EACH STUDENT PREPARE A TIMBER SALES CONTRACT FOR A SPECIFIED TRACT OF TIMBER THAT WILL MEET FOREST SERVICE GUIDELINES.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. CRUISER STICKS

2. STEEL TAPE AND PINS

3. TRANSIT OR STAFF COMPASS

4. TALLY BOOKS

5. EXAMPLES OF TIMBER SALES CONTRACTS

F. EXAMPLES OF SUPPORTING REFERENCES

1. ANDERSON. DAVID A. AND SMITH, WILLIAM H. FORESTS AND FORESTRY. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1970, 357 PAGES.

THIS TEXT COVERS MOST ASPECTS OF MARKETING TIMBER PRODUCTS AND WOULD BE PARTICULARLY APPLICABLE TO THE SOUTHERN FOREST REGION.

2. FORESTRY IN AGRICULTURAL EDUCATION IN VIRGINIA. RICHMOND, VIRGINIA: AGRICULTURAL EDUCATION SERVICE, STATE DEPARTMENT OF EDUCATION. 1970, 119 PAGES.

UNIT VIII OF THIS TEACHER'S MANUAL CONTAINS TECHNICAL INFORMATION CONCERNING MARKETING OF FOREST PRODUCTS. SUGGESTIONS FOR TIMBER SALE CONTRACT PROVISIONS ARE ALSO COVERED IN THIS PUBLICATION.

ESTABLISHING LOGGING ROADS, TRAILS AND LOG LANDINGS

UNIT CONCEPT: FOREST ROADWAYS, TRAILS AND LANDINGS THAT ARE CONSTRUCTED AFTER A CAREFUL CONSIDERATION OF TERRAIN AND INTENDED MANAGEMENT PRACTICES WILL RESULT IN MORE EFFICIENT USE OF TIME AND LABOR IN FOREST OPERATIONS AND A MINIMUM OF FOREST AND SOIL DAMAGE.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN A SPECIFIED FOREST AREA AND INTENDED MANAGEMENT PRACTICES, USE SURVEYING AND SOIL EQUIPMENT TO LAY OUT A FOREST ROAD, TRAIL OR LOG LANDING WHICH WILL CARRY THE INTENDED TRAFFIC UNDER ANTICIPATED WEATHER CONDITIONS.

2. WHEN GIVEN A SPECIFIED FOREST ROAD LAYOUT, SAFELY OPERATE ALL TIMBER REMOVAL EQUIPMENT AND ROAD CONSTRUCTION EQUIPMENT NEEDED TO CONSTRUCT AND MAINTAIN THE ROAD.

3. WHEN GIVEN A SPECIFIED FOREST ROAD OR TRAIL NEEDING CULVERT OR BRIDGE CONSTRUCTION, USE THE TOOLS, EQUIPMENT AND MATERIALS TO CONSTRUCT AND MAINTAIN THE BRIDGE OR CULVERT ACCORDING TO THE DESIGN BLUEPRINTS.

B. INSTRUCTIONAL AREAS

1. LAYING OUT THE FOREST ROAD, TRAIL OR LANDINGS

   A. READING TOPOGRAPHIC MAPS AND AERIAL PHOTOGRAPHS

   B. IDENTIFYING THE INTENDED MANAGEMENT PRACTICES

      (1) IDENTIFYING FIRE PROTECTION NEEDS
      (2) IDENTIFYING INTENDED SILVICULTURAL PRACTICES
      (3) IDENTIFYING INTENDED HARVESTING AND MARKETING SYSTEMS

   C. IDENTIFYING THE TYPE OF ROAD NEEDED

      (1) IDENTIFYING TYPES OF PERMANENT ROADS
      (2) IDENTIFYING THE TYPES OF TEMPORARY ROADS

   D. DETERMINING LAND OWNERSHIP OR ROAD RIGHTS-OF-WAY

(1) USING A TRANSIT AND ROD
(2) CHAINING

E. DETERMINING THE SOIL CHARACTERISTICS

(1) DETERMINING SOIL STRUCTURE
(2) DETERMINING SOIL TEXTURE
(3) DETERMINING DRAINAGE AND DRAINAGE PATTERNS

F. DETERMINING SLOPE

G. DETERMINING ROADBED HAZARDS

2. DEVELOPING AND MAINTAINING THE ROADBED

A. REMOVING TIMBER

B. GRADING THE ROADBED

C. OPERATING AND MAINTAINING THE EQUIPMENT

3. CONSTRUCTING AND MAINTAINING CULVERTS AND BRIDGES

A. READING CONSTRUCTION BLUEPRINTS

B. USING CONSTRUCTION MATERIALS

C. USING HAND AND POWER TOOLS AND EQUIPMENT

D. MAINTAINING CONSTRUCTION TOOLS AND EQUIPMENT

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. USING MAPS, AERIAL PHOTOGRAPHS AND SURVEYING EQUIPMENT, HAVE THE STUDENTS DETERMINE ROAD RIGHT-OF-WAY AND LAY OUT A TENTATIVE ROADWAY TO BE USED FOR A SPECIFIED LIST OF FORESTRY PRACTICES. HAVE A RESOURCE PERSON FROM THE FOREST SERVICE OR AN INDUSTRY REPRESENTATIVE DISCUSS THE ADVANTAGES AND DISADVANTAGES OF THE LAYOUT.

   B. HAVE A SERVICE FORESTER OR FOREST INDUSTRY REPRESENTATIVE ASSIST THE STUDENTS IN DETERMINING HOW AND WHAT FOREST MANAGEMENT FACTORS INFLUENCE ROAD TYPE AND LOCATION.

2. HAVE THE STUDENTS OBSERVE AND/OR ASSIST IN THE CONSTRUCTION OF A ROADWAY AND/OR LANDING TO BE USED FOR FORESTRY PURPOSES.

3. HAVE THE STUDENTS OBSERVE AND/OR ASSIST IN THE DEVELOPMENT OF CULVERTS OR BRIDGES TO BE USED ON FOREST ROADWAYS.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. GIVEN INTENDED MANAGEMENT PRACTICES AND USAGE OF A ROAD IN A GIVEN FOREST AREA, HAVE THE STUDENTS USE A TRANSIT, ROD AND CHAINING EQUIPMENT TO LAY OUT A FOREST ROADWAY WHICH WILL NOT CAUSE SERIOUS SOIL AND WATER CONSERVATION PROBLEMS AND WILL CARRY THE INTENDED TRAFFIC UNDER ALL COMMON WEATHER CONDITIONS.

2. HAVE EACH STUDENT DEMONSTRATE HIS ABILITY TO OPERATE THE EQUIPMENT USED IN FOREST ROAD BUILDING, SUCH AS, CHAIN SAWS, BULLDOZERS AND GRADERS, WITH SKILL NEEDED TO BE EFFICIENT AND SAFE.

3. HAVE EACH STUDENT DEMONSTRATE HIS ABILITY TO READ A DESIGN BLUEPRINT FOR A BRIDGE OR CULVERT.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. TOPOGRAPHIC MAPS

2. AERIAL PHOTOGRAPHS

3. HAND LEVEL

4. TRANSIT AND ROD

5. STEEL TAPE AND CHAINING PINS

6. COMMON CARPENTRY TOOLS

F. EXAMPLES OF SUPPORTING REFERENCES

1. CONSERVATION AIDE IV - SURVEYING. COLUMBUS, OHIO: OHIO AGRICULTURAL EDUCATION CURRICULUM MATERIALS SERVICE, THE OHIO STATE UNIVERSITY. 1972, 83 PAGES.

   THIS BOOKLET WILL PROVIDE THE TEACHER AND STUDENT WITH THE BASIC SURVEYING SKILLS NEEDED FOR LAYING OUT LOGGING ROADS, TRAILS AND LOG LANDINGS.

2. PERMANENT LOGGING ROADS FOR BETTER WOODLOT MANAGEMENT. WASHINGTON, D.C.: U.S. FOREST SERVICE, U.S. DEPARTMENT OF AGRICULTURE.

   THIS PAMPHLET PROVIDES FACTORS TO CONSIDER WHEN DEVELOPING LOGGING ROADS AS WELL AS CONSTRUCTION METHODS.

FELLING, LIMBING AND BUCKING TREES WITH THE CHAIN SAW

UNIT CONCEPT: FELLING, LIMBING AND BUCKING TREES ARE THE FIRST STAGES OF OPERATION IN THE LOGGING PROCESS. THE FELLER WILL USUALLY USE THE CHAIN SAW, AN AX AND WEDGES TO CUT DOWN MARKED TREES. MEMBERS OF THE FELLING CREW MUST BE PROFICIENT IN FELLING, LIMBING AND BUCKING TREES. THEY MUST ALSO COOPERATE WITH OTHER OPERATORS, IF THE LOGGING OPERATION IS GOING TO BE SAFE AND EFFICIENT.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. GIVEN A SPECIFIC AREA OF TIMBER TO BE HARVESTED AND CONSIDERING THE CONDITIONS WHICH EXIST, PLAN AND DESCRIBE THE PROCEDURES TO FOLLOW IN FELLING TREES WHICH WOULD:

   A. PROVIDE MAXIMUM SAFETY TO OPERATORS,

   B. PROVIDE MINIMUM DAMAGE TO EQUIPMENT,

   C. PROVIDE MINIMUM DAMAGE TO TREES BEING FELLED AND OTHER TREES, AND

   D. SAVE THE MAXIMUM TIME AND LABOR IN THE LOGGING OPERATION.

2. GIVEN A COMMONLY USED CHAIN SAW, AX AND WEDGES, SAFELY FELL TREES IN THE DESIRED DIRECTION.

3. GIVEN A COMMONLY USED CHAIN SAW, SAFELY LIMB TREES ON LEVEL OR SLOPING TERRAIN TO THE SATISFACTION OF THE INSTRUCTOR OR EMPLOYER.

4. GIVEN A COMMONLY USED CHAIN SAW AND OTHER NECESSARY EQUIPMENT, DEMONSTRATE THE SKILLS NECESSARY IN BUCKING TREES TO OBTAIN CORRECT LENGTHS FOR THE INTENDED USE OF LOGS OR BOLTS.

B. INSTRUCTIONAL AREAS

1. DETERMINING BEST TREE PLACEMENT WHEN FELLING TREES WITH THE CHAIN SAW

A. IDENTIFYING NATURAL CAUSES WHICH CREATE PROBLEMS IN PLACING TREES

(1) THE LEAN OF THE TREE AND SIZE OF CROWN
(2) THE WIND VELOCITY AND DIRECTION
(3) THE DEFECTS IN THE TREE
(4) THE OBSTACLES BENEATH THE TREE
(5) THE TERRAIN

B. DETERMINING THE ESCAPE ROUTE

C. CONSIDERING DAMAGE TO OTHER TREES

D. CONSIDERING RETRIEVAL SYSTEM

(1) TECHNIQUES AND EQUIPMENT TO BE USED
(2) OPERATOR SAFETY

2. FELLING TREES

A. MAKING THE UNDERCUT

(1) IDENTIFYING THE POSITION OF THE FELLER
(2) DETERMINING THE PROPER HEIGHT FROM THE GROUND
(3) MAKING HORIZONTAL AND ANGULAR CUTS

B. BACKCUTTING

(1) IDENTIFYING THE POSITION OF THE FELLER
(2) DETERMINING THE HEIGHT AND DISTANCE FROM THE UNDERCUT
(3) MAKING THE HORIZONTAL CUT ON THE OPPOSITE SIDE OF THE UNDERCUT
(4) USING WEDGES, AXES AND SLEDGES

C. FELLING DECAYING TREES

D. DISLODGING LODGED TREES

(1) DETERMINING THE EQUIPMENT TO BE USED

(A) CRAWLER
(B) SKIDDER

(2) PROVIDING FOR THE SAFETY OF THE FELLER AND OTHER WORKERS
(3) PROTECTING OTHER TREES
(4) PROTECTING THE LOGGING EQUIPMENT

3. LIMBING TREES WITH THE CHAIN SAW

A. DETERMINING CORRECT POSITION TO HANDLE SAW AND KEEP BALANCE

B. DETERMINE WHERE AND HOW TO MAKE THE CUTS

(1) IDENTIFYING OBSTACLES IN THE LIMBING AREA
(2) CONSIDERING THE TERRAIN
(3) MAKING CUTS FLUSH WITH THE LOG
(4) USING THE AX

4. BUCKING TREES WITH THE CHAIN SAW

A. DETERMINING CORRECT POSITION TO HANDLE SAW AND MAINTAIN BALANCE

B. DETERMINE WHERE AND HOW TO MAKE THE CUTS

(1) IDENTIFYING OBSTACLES IN BUCKING AREA
(2) SELECTING CORRECT LOG LENGTHS
(3) USING WEDGES, AX AND SLEDGE, WHEN NECESSARY

C. MAKING A STRAIGHT CUT THROUGH THE LOG

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. VISIT A LOGGING OPERATION AND HAVE A RESOURCE PERSON (LOGGER, LOGGING OPERATION INSPECTOR, FOREST FOREMAN). DISCUSS THE FACTORS WHICH SHOULD BE CONSIDERED IN FELLING TREES. THE STUDENTS SHOULD OBSERVE THE FELLING OPERATION AND FELL TREES THEMSELVES, IF POSSIBLE.

2. HAVE EACH STUDENT FELL A NUMBER OF TREES ON THE LAND LABORATORY OR WHILE PARTICIPATING IN HIS OCCUPATIONAL EXPERIENCE PROGRAM.

3. HAVE EACH STUDENT LIMB A NUMBER OF TREES WHICH HAVE BEEN FELLED ON THE FOREST LAND LABORATORY OR WHILE PARTICIPATING IN HIS OCCUPATIONAL EXPERIENCE PROGRAM.

4. HAVE EACH STUDENT DETERMINE THE CORRECT LENGTH OF LOGS OR BOLTS TO BE CUT FROM SEVERAL LOGS AND BUCK THE LOGS TO THE DESIRED LENGTH.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE EACH STUDENT PLAN AND DESCRIBE THE PROCEDURES TO FOLLOW IN FELLING A SPECIFIED GROUP OF TREES THAT WILL:

A. PROVIDE MAXIMUM SAFETY TO OPERATORS,

B. PROVIDE MINIMUM DAMAGE TO EQUIPMENT,

C. PROVIDE MINIMUM DAMAGE TO TREES BEING FELLED AND OTHER TREES, AND

D. SAVE THE MAXIMUM TIME AND LABOR IN THE LOGGING OPERATION.

2. HAVE EACH STUDENT DEMONSTRATE THE KNOWLEDGE AND SKILLS REQUIRED IN FELLING TREES IN DESIRED POSITIONS.

3. HAVE EACH STUDENT DEMONSTRATE THE REQUIRED SKILLS IN LIMBING TREES TO THE SATISFACTION OF THE TEACHER OR EMPLOYER.

4. HAVE EACH STUDENT DEMONSTRATE REQUIRED SKILLS IN BUCKING TREES TO OBTAIN CORRECT LENGTHS FOR THE INTENDED USE.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. COMMONLY USED CHAIN SAW AND ACCESSORIES

2. WEDGES

3. AXES

4. SLEDGES

F. EXAMPLES OF SUPPORTING REFERENCES

1. CONWAY, STEVE. TIMBER CUTTING PRACTICES. SAN FRANCISCO, CALIFORNIA: MILLER FREEMAN PUBLISHERS, INC. 1973, 192 PAGES.

   THIS TEXT WOULD BE AN EXCELLENT REFERENCE FOR THE TEACHER AND STUDENT FOR ALL ASPECTS OF THE FELLING, LIMBING AND BUCKING PROCESSES.

2. FORESTRY IN AGRICULTURAL EDUCATION IN VIRGINIA. RICHMOND, VIRGINIA: AGRICULTURAL EDUCATION SERVICE, STATE DEPARTMENT OF EDUCATION. 1970, PP. 66-71.

   THIS TEACHER'S MANUAL INDICATES THE PROCEDURES THAT MAY BE USED TO TEACH THIS UNIT AS WELL AS KEY AREAS TO COVER.

3. MANAGEMENT OF FOREST RESOURCES FOR MULTIPLE USE. UNIVERSITY PARK, PENNSYLVANIA: DEPARTMENT OF AGRICULTURAL EDUCATION, THE PENNSYLVANIA STATE UNIVERSITY. 1970, 124 PAGES.

   PROBLEM AREA FOUR IN THIS REFERENCE COVERS BASIC CHAIN SAW USE WITH ATTENTION GIVEN TO SAFETY PROCEDURES.

3. PRODUCTS FROM OUR FORESTS - THEIR MANUFACTURE AND USE - STUDENT RESOURCE UNIT. UNIVERSITY PARK, PENNSYLVANIA: DEPARTMENT OF AGRICULTURAL EDUCATION, THE PENNSYLVANIA STATE UNIVERSITY. 1971, 95 PAGES.

IN PROBLEM AREA TWO OF THIS REFERENCE, THE BASIC STEPS IN FELLING, LIMBING AND BUCKING TREES ARE COVERED. THIS REFERENCE CAN EASILY BE READ AND UNDERSTOOD BY STUDENTS.

SKIDDING LOGS OR BOLTS

UNIT CONCEPT: BECAUSE IT IS USUALLY NOT PRACTICAL OR POSSIBLE TO BRING THE LOG LOADING AND TRANSPORTING EQUIPMENT INTO THE AREA WHERE TREES ARE FELLED, THE LOGS ARE COMMONLY DRAGGED OR SKIDDED TO A CENTRAL LOADING AREA.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN A COMMONLY USED SKIDDER OR CRAWLER, DEMONSTRATE THE SKILLS REQUIRED IN SKIDDING LOGS OR BOLTS FROM THE FELLING AREA TO THE LOADING AREA THAT WILL:

   A. PROVIDE MAXIMUM SAFETY TO OPERATORS,

   B. PROVIDE MINIMUM DAMAGE TO EQUIPMENT,

   C. PROVIDE MINIMUM DAMAGE TO LOGS OR BOLTS BEING SKIDDED AND TO STANDING TREES, AND

   D. SAVE THE MAXIMUM TIME AND LABOR IN THE LOGGING OPERATION.

2. WHEN GIVEN A COMMONLY USED SKIDDER OR CRAWLER, MAINTAIN IT ACCORDING TO THE INSTRUCTIONS IN THE OPERATOR'S MANUAL.

B. INSTRUCTIONAL AREAS

1. IDENTIFYING THE TYPES OF EQUIPMENT USED FOR SKIDDING

   A. RUBBER-TIRED SKIDDERS

      (1) IDENTIFYING MAJOR CHARACTERISTICS

         (A) SKIDDING CAPACITY
         (B) MANEUVERABILITY
         (C) SPEED
         (D) OPERATING COST
         (E) DURABILITY
         (F) OPTIONAL ATTACHMENTS
         (G) SAFETY FEATURES

      (2) IDENTIFYING MAJOR OPERATING PARTS AND THEIR FUNCTIONS

(3) IDENTIFYING ADVANTAGES AND LIMITATIONS

B. CRAWLER TRACTORS

(1) IDENTIFYING MAJOR CHARACTERISTICS

(A) SKIDDING CAPACITY
(B) MANEUVERABILITY
(C) SPEED
(D) OPERATING COST
(E) OPTIONAL ATTACHMENTS
(F) SAFETY FEATURES

(2) IDENTIFYING MAJOR OPERATING PARTS AND THEIR FUNCTIONS
(3) IDENTIFYING ADVANTAGES AND LIMITATIONS

C. TREE HARVESTING MACHINES

(1) IDENTIFYING MAJOR CHARACTERISTICS

(A) CAPACITY
(B) MANEUVERABILITY
(C) SPEED
(D) OPERATING COST
(E) OPTIONAL ATTACHMENTS
(F) SAFETY FEATURES

(2) IDENTIFYING MAJOR OPERATING PARTS AND THEIR FUNCTIONS
(3) IDENTIFYING ADVANTAGES AND LIMITATIONS

2. SKIDDING TECHNIQUES AND PROCEDURES

A. PROVIDING FOR OPERATOR PROTECTION

(1) DETERMINING PROPER DRESS
(2) IDENTIFYING PROTECTIVE DEVICES ON EQUIPMENT
(3) IDENTIFYING SKIDDING HAZARDS

B. CHOKING LOGS OR BOLTS

(1) CHOKING LOGS WITH CABLE OR CHAIN
(2) USING HYDRAULIC EQUIPMENT ON THE SKIDDER FOR CHOKING
(3) MATCHING SKIDDER CAPACITY TO NUMBER AND/OR WEIGHT OF LOGS

C. OPERATING THE SKIDDER

(1) USING THE CONTROLS ON THE EQUIPMENT

(2) OPERATING ACCESSORY ATTACHMENTS

(A) HYDRAULIC EQUIPMENT
(B) LINE EQUIPMENT

(3) MANEUVERING AROUND TURNS

D. LOCATING THE LOGS OR BOLTS FOR EASE OF LOADING

3. MAINTAINING THE SKIDDING EQUIPMENT

A. DEVELOPING THE LUBRICATION PROGRAM

(1) USING SERVICING RECORDS
(2) USING SERVICE MANUALS

B. MAINTAINING THE ENGINE

(1) COOLING SYSTEM
(2) CARBURETOR
(3) IGNITION SYSTEM
(4) LUBRICATION SYSTEMS

(A) CRANKCASE
(B) TRANSMISSION
(C) HYDRAULIC SYSTEM

C. CHECKING VISIBLE PARTS OF EQUIPMENT FOR DAMAGE OR EXCESSIVE WEAR

D. MAINTAINING AND REPAIRING CABLES AND CHAINS

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. HAVE A RESOURCE PERSON (OPERATOR OR FOREST FOREMAN) DEMONSTRATE SAFETY PRACTICES WHICH SHOULD BE USED IN SKIDDING LOGS OR BOLTS.

B. HAVE THE STUDENTS PRACTICE SAFE OPERATION OF A COMMONLY USED SKIDDER OR CRAWLER UNDER SUPERVISION OF THE INSTRUCTOR AND/OR FOREST INDUSTRY EMPLOYEES.

C. HAVE THE STUDENTS COMPARE DIFFERENT TYPES OF COMMONLY USED SKIDDERS OR CRAWLERS BY OBSERVING OR DETERMINING THE FOLLOWING DIFFERENCES:

(1) SKIDDING CAPACITY,
(2) MANEUVERABILITY,
(3) SPEED,
(4) DURABILITY,

(5) SAFETY FEATURES,
(6) WORK OUTPUT DURING A PERIOD OF TIME,
(7) OPERATING COST, AND
(8) ADVANTAGES AND DISADVANTAGES IN ACQUIRING AND USING OPTIONAL ATTACHMENTS.

2. HAVE THE STUDENTS DEVELOP A DAILY MAINTENANCE PLAN FOR SKIDDING EQUIPMENT.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE EACH STUDENT SKID LOGS OR BOLTS OVER A PRESCRIBED COURSE WITH A COMMONLY USED SKIDDER OR CRAWLER IN A MANNER THAT WILL:

   A. PROVIDE MAXIMUM SAFETY TO OPERATORS,

   B. PROVIDE MINIMUM DAMAGE TO EQUIPMENT,

   C. PROVIDE MINIMUM DAMAGE TO LOGS OR BOLTS BEING SKIDDED AND TO STANDING TREES, AND

   D. SAVE THE MAXIMUM TIME AND LABOR IN THE LOGGING OPERATION.

2. HAVE EACH STUDENT DEMONSTRATE HIS ABILITY TO PERFORM MAINTENANCE OPERATIONS ON SKIDDERS AND/OR CRAWLERS AS SPECIFIED BY THE INSTRUCTOR.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. COMMONLY USED SKIDDERS AND/OR CRAWLERS
2. HARD HATS AND OTHER ITEMS OF SAFETY APPAREL
3. TOOL KIT

F. EXAMPLES OF SUPPORTING REFERENCES

1. BROMLEY, W. S. PULPWOOD PRODUCTION. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1969, 259 PAGES.

   THIS TEXT CONTAINS AN EXCELLENT DISCUSSION OF SKIDDING AND OTHER PREHAULING PRACTICES WITH ATTENTION ALSO GIVEN TO SELECTION OF SKIDDING EQUIPMENT.

2. HARVESTING FORESTRY PRODUCTS. KIRBYVILLE, TEXAS: VOCATIONAL INSTRUCTIONAL SERVICES, TEXAS STATE DEPARTMENT OF EDUCATION. 1971, 200 PAGES.

   UNIT XI OF THIS TEACHER'S MANUAL PROVIDES INFORMATION, TRANSPARENCIES AND REFERENCES CONCERNING THE OPERATION OF SKIDDERS AND SKIDDING EQUIPMENT.

3. TRACTOR MAINTENANCE. ATHENS, GEORGIA: ENGINEERING CENTER, AMERICAN ASSOCIATION FOR VOCATIONAL INSTRUCTIONAL MATERIALS. 1970, 145 PAGES.

   THIS BOOKLET IS DESIGNED TO PROVIDE MAINTENANCE INFORMATION FOR TRACTORS, BUT WOULD BE USEFUL FOR WORK WITH SKIDDERS.

LOADING, TRANSPORTING AND UNLOADING LOGS OR BOLTS

UNIT CONCEPT: LOADING, TRANSPORTING AND UNLOADING LOGS OR BOLTS ARE THE LAST THREE OPERATIONS IN THE LOGGING PROCESS. LOGGING OPERATORS AND FOREMEN MUST PLAN AND CONDUCT LOADING, TRANSPORTING AND UNLOADING PROCESSES THAT WILL BE SAFE AND EFFICIENT TO COMPLETE THE LOGGING OPERATION.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. IDENTIFY THE MAJOR TYPES OF LOADING AND UNLOADING EQUIPMENT USED IN HIS REGION WITH COMPETENCY REQUIRED TO SELECT THE MOST APPROPRIATE TYPE OF EQUIPMENT FOR A SPECIFIED SITUATION.

2. WHEN GIVEN A COMMONLY USED LOADER, LOAD AND/OR UNLOAD LOGS OR BOLTS IN A MANNER THAT WILL:

   A. PROVIDE MAXIMUM SAFETY TO OPERATORS,

   B. PROVIDE MINIMUM DAMAGE TO LOGGING AND TRANSPORTING EQUIPMENT, AND

   C. SAVE THE MAXIMUM TIME AND LABOR IN THE LOGGING OPERATION.

3. WHEN GIVEN A COMMONLY USED TRANSPORTING TRUCK, DEMONSTRATE THE KNOWLEDGE AND SKILLS REQUIRED TO TRANSPORT LOGS OR BOLTS FROM THE FOREST LOADING AREA TO THE PROCESSING PLANT IN A MANNER THAT WILL:

   A. PROVIDE MAXIMUM SAFETY FOR LOGGING OPERATORS, OTHER DRIVERS AND WORKERS;

   B. PROVIDE MINIMUM DAMAGE TO LOGGING EQUIPMENT, TRANSPORTING TRUCKS AND OTHER VEHICLES;

   C. SAVE THE MAXIMUM TIME AND LABOR IN TRANSPORTING LOGS OR BOLTS; AND

   D. PROVIDE MINIMUM DAMAGE TO PUBLIC AND PRIVATE PROPERTY.

B. INSTRUCTIONAL AREAS

1. DETERMINING THE TYPES OF EQUIPMENT USED IN LOADING AND UNLOADING LOGS AND BOLTS

A. USING THE FRONT END LOADER

(1) IDENTIFYING MAJOR CHARACTERISTICS

(A) LIFTING CAPACITY
(B) MANEUVERABILITY
(C) SPEED
(D) OPERATING COST
(E) DURABILITY
(F) OPTIONAL ATTACHMENTS

(2) IDENTIFYING MAJOR OPERATING PARTS AND THEIR FUNCTIONS
(3) IDENTIFYING ADVANTAGES AND LIMITATIONS

B. USING THE KNUCKLE BOOM LOADER

(1) MAJOR CHARACTERISTICS

(A) LIFTING CAPACITY
(B) MANEUVERABILITY
(C) OPERATING COST
(D) OPTIONAL ATTACHING
(E) CURABILITY
(F) SAFETY FEATURES

(2) IDENTIFYING MAJOR OPERATING PARTS AND THEIR FUNCTIONS
(3) IDENTIFYING ADVANTAGES AND LIMITATIONS

C. USING THE CRANE TYPE LOADER

(1) MAJOR CHARACTERISTICS

(A) LIFTING CAPACITY
(B) MANEUVERABILITY
(C) SPEED
(D) OPERATING COST
(E) DURABILITY
(F) OPTIONAL ATTACHMENTS

(2) IDENTIFYING MAJOR OPERATING PARTS AND THEIR FUNCTIONS
(3) IDENTIFYING ADVANTAGES AND LIMITATIONS

2. OPERATING THE LOADING AND/OR UNLOADING EQUIPMENT

A. PROVIDING FOR SAFETY OF OPERATORS AND PROTECTION OF EQUIPMENT

(B) MAXIMUM WEIGHT
(C) SECURING LOGS OR BOLTS

(4) PROPER USE OF TRIP RECORDS
(5) RESPONSIBILITIES DURING LOADING AND/OR UNLOADING

C. SELECTING THE TRANSPORTATION ROUTE

(1) IDENTIFYING OBSTACLES BETWEEN THE LOGGING AREA AND THE PROCESSING PLANT

(A) BUSINESS DISTRICTS
(B) RESIDENTIAL AREAS
(C) SCHOOL LOCATIONS
(D) TRAFFIC
(E) CONSTRUCTION OPERATIONS

(2) CONSIDERING THE ROAD CONDITIONS
(3) CONSIDERING THE DISTANCE FROM THE LOGGING AREA TO THE PROCESSING PLANT
(4) CONSIDERING LEGAL RESTRICTIONS FOR USE OF PUBLIC ROADS

(A) MAXIMUM WEIGHT ON BRIDGES
(B) SPEED LIMITS
(C) SPECIAL PERMITS
(D) DIMENSIONS OF LOADS

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. HAVE THE STUDENTS COMPARE TWO DIFFERENT TYPES OF COMMONLY USED LOADING, TRANSPORTING AND UNLOADING EQUIPMENT BY EXPLAINING THE FOLLOWING DIFFERENCES:

   A. DURABILITY,

   B. OPERATING COST,

   C. MANEUVERABILITY,

   D. SAFETY FEATURES,

   E. WORK OUTPUT DURING A PERIOD OF TIME, AND

   F. ADVANTAGES AND DISADVANTAGES IN ACQUIRING AND USING OPTIONAL ATTACHMENTS.

2. A. USE RESOURCE PERSONNEL (EQUIPMENT OPERATORS, LOGGING FOREMEN, TRUCK DRIVERS) TO DISCUSS AND DEMONSTRATE SAFE

OPERATING PRACTICES WHICH SHOULD BE USED IN LOADING, TRANSPORTING AND UNLOADING LOGS OR BOLTS.

B. HAVE STUDENTS INDIVIDUALLY IDENTIFY HAZARDOUS CONDITIONS IN THE LOGGING OPERATION WHILE LOADING, TRANSPORTING AND UNLOADING LOGS OR BOLTS.

C. HAVE STUDENTS DEMONSTRATE SAFE HANDLING AND OPERATION OF COMMONLY USED LOADING, TRANSPORTING AND UNLOADING LOGGING EQUIPMENT.

D. HAVE THE STUDENTS MAKE A VISUAL INSPECTION AND IDENTIFY DAMAGED AND/OR WORN PARTS ON COMMONLY USED LOADING, TRANSPORTING AND UNLOADING EQUIPMENT.

E. HAVE STUDENTS LUBRICATE SPECIFIED SYSTEMS OR PARTS OF COMMONLY USED LOADING, TRANSPORTING AND UNLOADING EQUIPMENT.

3. HAVE THE STUDENTS DO RESEARCH TO DETERMINE THE LOCAL AND STATE LAWS CONCERNING TRANSPORTATION OF LOGS, BOLTS AND OTHER FOREST PRODUCTS ON HIGHWAYS.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE EACH STUDENT LIST THE MAJOR FACTORS WHICH SHOULD BE CONSIDERED WHEN SELECTING EQUIPMENT FOR LOADING AND/OR UNLOADING LOGS AND BOLTS.

2. HAVE EACH STUDENT DEMONSTRATE HIS ABILITY TO OPERATE A COMMON LOADER. THE STUDENT SHOULD DISPLAY SAFETY PROCEDURES AS WELL AS HIS ABILITY TO OPERATE THE EQUIPMENT.

3. HAVE EACH STUDENT LIST THE FACTORS WHICH SHOULD BE CONSIDERED WHEN SELECTING A ROUTE FOR TRANSPORTING LOGS OR BOLTS FROM THE FOREST TO THE PROCESSING SITE.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. HARD HATS AND OTHER SAFETY APPAREL

2. RUBBER-TIRED SKIDDER AND/OR CRAWLER

3. TOOL KITS FOR ENGINE AND EQUIPMENT MAINTENANCE

F. EXAMPLES OF SUPPORTING REFERENCES

1. BROMLEY, W. S. PULPWOOD PRODUCTION. DANVILLE, ILLINOIS:

THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1969, 259 PAGES.

THIS TEXT IS AN EXCELLENT SOURCE OF INFORMATION CONCERNING SELECTION, OPERATION AND MAINTENANCE OF LOADING, TRANSPORTING AND UNLOADING EQUIPMENT FOR LOGS AND BOLTS.

2. HARVESTING FORESTRY PRODUCTS. KIRBYVILLE, TEXAS: VOCATIONAL INSTRUCTIONAL SERVICES, TEXAS STATE DEPARTMENT OF EDUCATION. 1971, 200 PAGES.

THIS TEACHER'S MANUAL CONTAINS INFORMATION AND TRANSPARENCIES CONCERNING EQUIPMENT USED IN LOADING, TRANSPORTING AND UNLOADING LOGS AND BOLTS.

3. OPERATING THE KNUCKLE-BOOM LOADER. CLEMSON, SOUTH CAROLINA: VOCATIONAL EDUCATION MEDIA CENTER, CLEMSON UNIVERSITY. 1972, 29 PAGES.

THIS STUDENT TRAINING MANUAL AND INSTRUCTOR'S GUIDE PROVIDES INSTRUCTIONS AND CONTROL EXERCISES TO BE USED WITH THE SCALE MODEL KNUCKLE BOOM LOADER, A TRAINING MODEL OF A FULL-SCALE LOADER. THE MANUAL, HOWEVER, ALSO MAY BE HELPFUL TO TEACHERS AND STUDENTS USING A FULL-SCALE LOADER FOR TRAINING.

V

WOOD UTILIZATION
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SCALING AND GRADING SAW LOGS

DEBARKING LOGS

OPERATING AND MAINTAINING THE HEADRIG

OPERATING AND MAINTAINING THE EDGER AND THE TRIMMER

MAINTAINING AND REPLACING PULLEYS AND V-BELTS

STACKING, AIR DRYING AND KILN DRYING LUMBER

WOOD PRESERVATION

SCALING AND GRADING LUMBER

SCALING AND GRADING SAW LOGS

UNIT CONCEPT: LOG SCALING AND GRADING TECHNIQUES ARE USED BY FOREST INDUSTRY EMPLOYEES SUCH AS TIMBER BUYERS, LOG GRADERS AND MILL SAWYERS IN OBTAINING THE HIGHEST PROFIT AND GREATEST QUANTITY OR QUALITY OF LUMBER FROM LOGS.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. USING BARK OR WOOD CHARACTERISTICS, IDENTIFY THE SPECIES OF LOGS WITH 100% ACCURACY.

2. USING A YARDSTICK AND A LOG VOLUME TABLE COMMONLY USED IN THE AREA OR A LOG SCALE STICK, DETERMINE THE NUMBER OF BOARD FEET IN A LOG WITHIN ± 2% AND RECORD THE RESULTS IN A TALLY BOOK.

3. USING U.S. FOREST SERVICE GUIDELINES, DETERMINE THE USE CLASS AND GRADE OF HARDWOOD AND/OR SOFTWOOD SAW LOGS WITH ACCURACY WHICH WILL MEET MILL STANDARDS.

B. INSTRUCTIONAL AREAS

1. IDENTIFYING SAW LOG SPECIES

   A. IDENTIFYING BARK CHARACTERISTICS

   B. IDENTIFYING WOOD CHARACTERISTICS

   C. USING IDENTIFICATION KEYS

2. SCALING LOGS

   A. MEASURING THE DIAMETER INSIDE THE BARK OF THE SMALL END

   B. DETERMINING LOG LENGTH

   C. RECORDING VOLUMES

3. GRADING HARDWOOD LOGS

   A. GRADING FACTORY CLASS LOGS

(1) IDENTIFYING POSITION OF LOG IN TREE
(2) IDENTIFYING LOG DEFECTS
(3) MEASURING LOG DIAMETER AND LENGTH WITHOUT TRIM
(4) DETERMINING THE POOREST LOG FACE
(5) DETERMINING THE CLEAR CUTTINGS ON EACH OF THE THREE BEST FACES
(6) DETERMINING THE PERCENT OF SWEEP
(7) RECORDING THE GRADE OF THE LOG

B. IDENTIFYING CONSTRUCTION CLASS LOGS

C. IDENTIFYING LOCAL-USE CLASS LOGS

4. GRADING SOFTWOOD LOGS

A. IDENTIFYING VENEER CLASS LOGS

B. GRADING YARD LUMBER LOGS

(1) IDENTIFYING THE NUMBER OF CLEAR FACES
(2) DEDUCTING FOR SWEEP
(3) DEDUCTING FOR HEART ROT

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. HAVE THE STUDENTS MAKE A COLLECTION AND DISPLAY OF BARK AND WOOD FROM LOGS TO BE USED IN LOG SPECIES IDENTIFICATION.

2. PRACTICE SCALING LOGS OF VARYING SIZES TO OBTAIN PROFICIENCY IN LOG SCALING.

3. A. HAVE A FOREST SERVICE REPRESENTATIVE OR A FOREST INDUSTRY REPRESENTATIVE ASSIST THE STUDENTS IN LEARNING TO GRADE LOGS.

B. VISIT A SAW MILL AND OBSERVE AND/OR ASSIST THE LOG GRADER IN GRADING LOGS. HAVE THE LOG GRADER EXPLAIN THE TECHNIQUES HE USES IN GRADING.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE EACH STUDENT IDENTIFY THE SPECIES OF 10 DIFFERENT LOGS BY OBSERVATION AND/OR USING IDENTIFICATION KEYS WITH 100% ACCURACY.

2. HAVE EACH STUDENT SCALE 10 LOGS USING A SCALE STICK OR YARDSTICK AND LOG VOLUME TABLES WITH ACCURACY OF ± 2%.

3. HAVE EACH STUDENT GRADE 10 HARDWOOD AND/OR SOFTWOOD LOGS WITH ACCURACY REQUIRED BY MILL STANDARDS.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. YARDSTICK OR LOG SCALE STICK
2. LOG VOLUME TABLES
3. TALLY BOOKS
4. FOREST SERVICE OR INDUSTRY GRADING STANDARDS

F. EXAMPLES OF SUPPORTING REFERENCES

1. ANDERSON, DAVID A. AND SMITH, WILLIAM A. FORESTS AND FORESTRY. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1970, 357 PAGES.

   THIS TEXT CONTAINS THE BASIC INFORMATION AND PRINCIPLES OF GRADING AND SCALING SAW LOGS.

2. GRADE DEFECTS IN HARDWOOD TIMBER AND LOGS. WASHINGTON, D.C.: U.S. DEPARTMENT OF AGRICULTURE, U.S. GOVERNMENT PRINTING OFFICE. 1969, 39 PAGES.

   THIS PAMPHLET CONTAINS PICTURES AND DESCRIPTIONS OF HARDWOOD TIMBER AND LOG DEFECTS.

3. A GUIDE TO HARDWOOD LOG GRADING. UPPER DARBY, PENNSYLVANIA: U.S. FOREST SERVICE, U.S. DEPARTMENT OF AGRICULTURE. 1965.

   THIS PAMPHLET CONTAINS THE TECHNICAL INFORMATION REQUIRED FOR GRADING HARDWOOD LOGS ALONG WITH A STEP-BY-STEP ACCOUNT OF THE PROCEDURES TO FOLLOW.

DEBARKING LOGS

UNIT CONCEPT: LOGS ARE DEBARKED FOR THE FOLLOWING REASONS: (1) THERE IS A MARKET DEMAND FOR CHIPPED WASTE WOOD; (2) SAWS CAN BE USED LONGER BETWEEN SHARPENING AND REPLACEMENT IF THE BARK (WITH ITS DIRT, GRAVEL AND OTHER FOREIGN OBJECTS) IS REMOVED; AND (3) DEBARKING ALLOWS THE SAWYER TO SEE AND IDENTIFY DEFECTS SO THAT THE LOG CAN MORE EASILY BE POSITIONED FOR OBTAINING MAXIMUM LUMBER WHILE CUTTING.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN COMMONLY USED MECHANICAL AND/OR HYDRAULIC DEBARKING EQUIPMENT, DEBARK LOGS WITH COMPETENCY NEEDED TO MEET LOCAL MILL STANDARDS.

2. WHEN GIVEN COMMONLY USED DEBARKING EQUIPMENT, PERFORM THE MAINTENANCE TASKS WHICH ARE NECESSARY TO REDUCE DAMAGE AND EXCESSIVE WEAR.

B. INSTRUCTIONAL AREAS

1. USING MECHANICAL DEBARKING EQUIPMENT

   A. OPERATING THE EQUIPMENT

      (1) ADJUSTING THE EQUIPMENT
      (2) LOCATING THE LOGS ON THE DEBARKING EQUIPMENT
      (3) OPERATING THE CONTROLS
      (4) DETERMINING THE PROPER AMOUNT OF TIME AND DEPTH FOR DEBARKING

   B. MAINTAINING THE EQUIPMENT

      (1) IDENTIFYING DAMAGED OR WORN PARTS
      (2) LUBRICATING NECESSARY PARTS
      (3) CLEANING THE EQUIPMENT

2. USING HYDRAULIC DEBARKING EQUIPMENT

   A. OPERATING THE EQUIPMENT

      (1) ADJUSTING THE EQUIPMENT

(2) LOCATING THE LOGS FOR DEBARKING
(3) OPERATING THE CONTROLS
(4) DETERMINING THE PROPER AMOUNT OF TIME FOR LEAVING LOGS IN THE HIGH-PRESSURE WATER JETS

B. MAINTAINING THE EQUIPMENT

(1) IDENTIFYING DAMAGED OR WORN PARTS
(2) LUBRICATING NECESSARY PARTS
(3) CLEANING THE EQUIPMENT

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. HAVE STUDENTS VISIT A SAWMILL AND USE A RESOURCE PERSON (OPERATOR, SAWMILL FOREMAN) TO DEMONSTRATE SAFETY PRACTICES, OPERATIONAL PROCEDURES AND MAINTENANCE TASKS WHICH SHOULD BE USED WHEN OPERATING THE DEBARKER.

   B. IF POSSIBLE, HAVE EACH STUDENT DEBARK SEVERAL LOGS WITH A COMMONLY USED DEBARKER UNDER THE SUPERVISION OF THE MILL FOREMAN OR THE DEBARKER OPERATOR.

2. HAVE THE STUDENTS OBSERVE AND ASSIST THE DEBARKER OPERATOR IN LUBRICATING SYSTEMS OR PARTS OF A COMMONLY USED DEBARKER.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE EACH STUDENT DEMONSTRATE HIS ABILITY TO DEBARK LOGS WITH A MECHANICAL OR HYDRAULIC DEBARKER UNDER SUPERVISION OF A SAWMILL EMPLOYEE AND THE INSTRUCTOR. THE STUDENT SHOULD BE EVALUATED ON HIS ABILITY TO OPERATE THE DEBARKER AND OBSERVANCE OF SAFETY PRACTICES.

2. HAVE EACH STUDENT LIST THE MAINTENANCE TASKS NEEDED FREQUENTLY ON A MECHANICAL OR HYDRAULIC DEBARKER.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

F. EXAMPLES OF SUPPORTING REFERENCES

1. <u>FORESTRY IN AGRICULTURAL EDUCATION IN VIRGINIA</u>. RICHMOND, VIRGINIA: AGRICULTURAL EDUCATION SERVICE, STATE DEPARTMENT OF EDUCATION. 1970, 119 PAGES.

   UNIT X OF THIS TEACHER'S MANUAL CONTAINS A DISCUSSION OF THE OPERATION OF THE ENTIRE MILLING PROCESS,

INCLUDING THE USE OF THE DEBARKER.

2. OPERATOR'S MANUALS FOR MECHANICAL AND HYDRAULIC DEBARKERS.

OPERATING AND MAINTAINING THE HEADRIG

UNIT CONCEPT: IF THE COMPONENTS OF THE HEADRIG ARE EFFICIENTLY OPERATED AND PERIODICALLY MAINTAINED, THE SAWYER WILL BE ABLE TO PRODUCE THE QUALITY AND QUANTITY OF ROUGH LUMBER WHICH WILL MEET MILL STANDARDS.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN A MANUAL HEADRIG, IDENTIFY AND EXPLAIN THE MAJOR PARTS AND THEIR FUNCTIONS AND OPERATE THE DOGS AND SETWORKS SO THAT THE LOG IS HELD FIRMLY IN POSITION AND THE DESIRED WIDTH OF BOARD IS PRODUCED.

2. IDENTIFY AND PERFORM THE MAINTENANCE PROCEDURES WHICH MUST BE FREQUENTLY PERFORMED ON MILL HEADRIGS ACCORDING TO THE MANUFACTURER'S RECOMMENDATIONS.

B. INSTRUCTIONAL AREAS

1. IDENTIFYING THE PARTS OF A HEADRIG AND THEIR FUNCTIONS

   A. IDENTIFYING THE TYPE OF SAW USED

   B. IDENTIFYING THE LOG HOLDING MECHANISM

   C. IDENTIFYING THE PARTS AND FUNCTION OF SETWORKS

   D. IDENTIFYING THE PARTS AND FUNCTION OF THE CARRIAGE

2. SETTING THE DOGS

3. OPERATING THE SETWORKS

4. MAINTAINING THE HEADRIG

   A. MAINTAINING THE HEADSAW

      (1) SHARPENING THE TEETH
      (2) REPLACING BITS AND SHANKS

   B. CHECKING FOR CORRECT ALIGNMENTS

      (1) CHECKING HEAD BLOCK-KNEE ASSEMBLY
      (2) CHECKING TRACKS
      (3) CHECKING TRUCKS FOR ENDPLAY

C. CHECKING FOR SLACK IN SETWORKS

D. LUBRICATING THE WORKING PARTS OF THE SETWORKS

E. CHECKING AND SHARPENING THE DOGS

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. VISIT DIFFERENT TYPES OF SAWMILLS TO OBSERVE THE OPERATION OF THE HEADRIG AND THE NUMBER OF EMPLOYEES USED TO OPERATE IT. ASSIST IN SETTING THE DOGS AND SETWORKS, IF POSSIBLE.

2. DEVELOP A MAINTENANCE SCHEDULE FOR A COMMONLY USED MILL HEADRIG INCLUDING CRITICAL AREAS NEEDING FREQUENT INSPECTION AND LUBRICATION.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. A. GIVE THE STUDENTS DIAGRAMS OF A COMMON HEADRIG. HAVE EACH STUDENT IDENTIFY THE PARTS ON THE DIAGRAM AND WRITE AN EXPLANATION OF THE FUNCTION OF EACH PART.

   B. HAVE EACH STUDENT SET THE DOGS AND SETWORKS ON A LOG AT THE SCHOOL MILL OR AT A MILL OF A COOPERATOR SO THAT THE LOG IS HELD FIRM AND A BOARD OF PRESCRIBED THICKNESS IS CUT.

2. HAVE EACH STUDENT INDICATE IN WRITING WHAT INSPECTION OR MAINTENANCE PROCEDURES ARE NECESSARY ON A HEADRIG AND THE REQUIRED FREQUENCY OF SUCH PRACTICES.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. GREASE GUN

2. ASSORTED FILES

3. TOOTH ANGLE GAUGE

4. SWAGE

F. EXAMPLES OF SUPPORTING REFERENCES

1. FORESTRY IN AGRICULTURAL EDUCATION IN VIRGINIA. RICHMOND, VIRGINIA: AGRICULTURAL EDUCATION SERVICE, STATE DEPARTMENT OF EDUCATION. 1970, 119 PAGES.

UNIT X OF THIS MANUAL COVERS MOST ASPECTS OF THE SAWMILL OPERATION INCLUDING OPERATION OF THE HEADRIG AND HEAD SAW.

2. LUNSTRUM, STANFORD J. CIRCULAR SAWMILLS AND THEIR EFFICIENT OPERATION. WASHINGTON, D.C.: U.S. FOREST SERVICE, U.S. DEPARTMENT OF AGRICULTURE. 1972, 86 PAGES.

   THIS MANUAL COVERS ALL OF THE MECHANICAL COMPONENTS OF THE PRIMARY SAWING FUNCTION, INCLUDING THE HEADRIG AND HEAD SAW.

OPERATING AND MAINTAINING THE EDGER AND THE TRIMMER

UNIT CONCEPT: PROPER OPERATION AND MAINTENANCE OF THE EDGER AND TRIMMER WILL RESULT IN PRODUCTION OF LUMBER WHICH MEETS MILL STANDARDS FOR QUALITY AND QUANTITY.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. IDENTIFY AND EXPLAIN THE PARTS AND THEIR FUNCTIONS OF AN EDGER AND A TRIMMER AND OPERATE THEM TO PRODUCE LUMBER WITH PARALLEL AND SQUARE EDGES AND ENDS AND THE GRADE DESIRED.

2. MAINTAIN AN EDGER AND TRIMMER ACCORDING TO THE MANUFACTURER'S RECOMMENDATIONS AND MILL STANDARDS.

B. INSTRUCTIONAL AREAS

1. IDENTIFYING LUMBER GRADES
   - A. GRADING HARDWOOD LUMBER
   - B. GRADING SOFTWOOD LUMBER
2. IDENTIFYING THE EDGER'S PARTS AND THEIR FUNCTIONS
   - A. IDENTIFYING SAW TYPE AND PARTS
   - B. IDENTIFYING CONTROL MECHANISMS
3. IDENTIFYING THE TRIMMER PARTS AND THEIR FUNCTIONS
   - A. IDENTIFYING TYPE OF SAW SET-UP
   - B. IDENTIFYING CONTROL MECHANISMS
4. OPERATING THE EDGER AND THE TRIMMER
   - A. IDENTIFYING DESIRED LUMBER WIDTH, LENGTH AND GRADE
   - B. OPERATING THE CONTROL MECHANISMS
5. MAINTAINING THE EDGER AND THE TRIMMER

A. INSPECTING THE SAW MECHANISM

B. REPLACING V-BELTS AND PULLEYS

C. LUBRICATING ESSENTIAL PARTS

D. MAINTAINING THE FOUNDATIONS

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. HAVE AN INDUSTRY EDGER OR TRIMMER ASSIST THE STUDENTS IN DETERMINING HOW BOARDS SHOULD BE EDGED AND TRIMMED AND IN PERFORMING THE OPERATIONS AT THE SCHOOL MILL OR AT A COOPERATOR'S MILL.

2. HAVE AN INDUSTRY REPRESENTATIVE ASSIST THE STUDENTS IN DETERMINING EDGER AND TRIMMER PARTS REQUIRING FREQUENT INSPECTION AND IN PERFORMING THE MAINTENANCE OPERATIONS.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. A. GIVE THE STUDENTS DIAGRAMS OF AN EDGER AND A TRIMMER AND HAVE THEM WRITE THE NAMES OF THE DIFFERENT PARTS AND THEIR FUNCTIONS.

   B. GIVE EACH STUDENT A NUMBER OF ROUGH SAWN BOARDS AND HAVE THEM INDICATE WITH CHALK HOW THEY WOULD EDGE AND TRIM THEM. IF POSSIBLE, HAVE AN INDUSTRY REPRESENTATIVE ASSIST IN GRADING THE STUDENT'S WORK.

2. HAVE EACH STUDENT INDICATE ON A DIAGRAM THE PARTS OF AN EDGER AND TRIMMER WHICH REQUIRE FREQUENT MAINTENANCE AND WRITE THE PROPER MAINTENANCE PROCEDURES.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. ASSORTED WRENCHES

2. GREASE GUN

F. EXAMPLES OF SUPPORTING REFERENCES

1. FORESTRY IN AGRICULTURAL EDUCATION IN VIRGINIA. RICHMOND, VIRGINIA: AGRICULTURAL EDUCATION SERVICE, STATE DEPARTMENT OF EDUCATION. 1970, 119 PAGES.

   UNIT X OF THIS MANUAL COVERS THE ENTIRE MILLING PROCESS INCLUDING OPERATION OF THE EDGER AND TRIMMER.

MAINTAINING AND REPLACING PULLEYS AND V-BELTS

UNIT CONCEPT: PULLEYS AND BELTS THAT ARE PROPERLY INSTALLED AND PERIODICALLY MAINTAINED, REPAIRED AND/OR REPLACED ACCORDING TO MANUFACTURER'S SPECIFICATIONS WILL RESULT IN LESS TIME LOST DUE TO EQUIPMENT BREAKDOWNS AND MORE EFFICIENT MILL OPERATIONS.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. SELECT V-BELTS AND PULLEYS TO BE USED IN A V-BELT DRIVE SYSTEM THAT WILL PROVIDE THE MOST EFFICIENT USE OF POWER CONSIDERING THE FOLLOWING FACTORS:

   A. BELT SIZE,

   B. PULLEY SIZES, AND

   C. NUMBER OF BELTS.

2. REPAIR AND/OR REPLACE DAMAGED OR WORN PULLEYS AND V-BELTS ACCORDING TO THE MANUFACTURER'S SPECIFICATIONS.

B. INSTRUCTIONAL AREAS

1. SELECTING V-BELT SIZE

   A. DETERMINING DESIGN HORSEPOWER OF POWER SOURCE

   B. DETERMINING DRIVE SHAFT SPEED

   C. IDENTIFYING THE STANDARDIZED BELT SIZES

2. SELECTING PULLEYS

   A. CONSIDERING THE KIND OF POWER TO BE USED

   B. DETERMINING THE BELT SIZE TO BE USED

   C. DETERMINING THE SHAFT SPEED

   D. IDENTIFYING CORRECT RELATIONSHIPS BETWEEN BELT SIZE AND PITCH DIAMETER RANGE

E. CALCULATING SPEED RATIO

(1) DETERMINING CORRECT DRIVE PULLEY DIAMETER
(2) DETERMINING CORRECT DRIVEN PULLEY DIAMETER

3. SELECTING THE NUMBER OF BELTS TO USE

A. CALCULATING THE CORRECTED HORSEPOWER PER BELT

B. IDENTIFYING THE DESIGN HORSEPOWER

C. CALCULATING THE NUMBER OF BELTS NEEDED

4. INSPECTING PULLEYS FOR DAMAGE OR WEAR

A. CHECKING PULLEYS FOR NICKS OR BURRS

B. IDENTIFYING PULLEY MISALIGNMENT

5. INSPECTING V-BELTS FOR DAMAGE OR WEAR

A. CHECKING V-BELTS FOR WEATHER DAMAGE

B. CHECKING V-BELTS FOR CORRECT BELT TENSION

C. CHECKING V-BELTS FOR UNEVEN STRETCHING

6. REPAIRING OR REPLACING PULLEYS AND V-BELTS

A. REMOVING NICKS OR BURRS FROM PULLEYS

B. REPLACING WORN PULLEYS

C. CHECKING REPLACED V-BELTS FOR PROPER TENSION

(1) USING A V-BELT TENSION TESTER
(2) COMPUTING CENTER OF SPAN DEFLECTION DISTANCE

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. GIVE THE STUDENTS SAMPLE PROBLEMS FROM ACTUAL SAWMILL OPERATIONS TO COMPUTE THE MOST EFFICIENT USE OF POWER BY SELECTING BELT SIZE, PULLEY SIZE AND NUMBER OF BELTS.

B. TAKE A FIELD TRIP TO A SAWMILL TO OBSERVE THE USE OF PULLEYS AND BELTS. CALCULATE THE IDEAL BELT SYSTEM AND COMPARE THE CALCULATIONS TO WHAT IS ACTUALLY BEING USED.

2. A. DEVELOP A CHECKLIST TO USE FOR PERIODICALLY INSPECTING PULLEYS AND V-BELTS.

   B. GET EXAMPLES OF BADLY WORN OR DAMAGED PULLEYS. INDICATE IN EACH INSTANCE WHETHER THE PULLEY SHOULD BE REPAIRED OR REPLACED. REPAIR THOSE THAT CAN BE REPAIRED.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE EACH STUDENT CALCULATE THE MOST EFFICIENT V-BELT DRIVE SYSTEM FOR A GIVEN MILL USING MANUFACTURER'S RECOMMENDATIONS FOR DETERMINING BELT SIZES, PULLEY SIZES AND THE NUMBER OF BELTS TO USE.

2. HAVE EACH STUDENT LIST THE MAJOR CAUSES OF DAMAGE OR WEAR TO V-BELTS AND PULLEYS IN SAWMILL OPERATIONS.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. MANUFACTURER'S MANUALS FOR V-BELT SELECTION, MAINTENANCE AND REPLACEMENT

2. V-BELT TENSION TESTER

F. EXAMPLES OF SUPPORTING REFERENCES

1. LUNSTRUM, STANFORD J. CIRCULAR SAW MILLS AND THEIR EFFICIENT OPERATION. ATLANTA, GEORGIA: U.S. FOREST SERVICE, U.S. DEPARTMENT OF AGRICULTURE. 1972, 86 PAGES.

   THIS REFERENCE CONTAINS AN EXCELLENT TECHNICAL DISCUSSION OF V-BELT AND PULLEY SELECTION, CARE AND REPAIR IN SAWMILL OPERATIONS.

STACKING, AIR DRYING AND KILN DRYING LUMBER

UNIT CONCEPT: MILLS WITH FACILITIES FOR PROPERLY AIR DRYING OR KILN DRYING LUMBER WILL PRODUCE LUMBER WITH LESS SHIPPING WEIGHT AND INCREASED LUMBER QUALITY WHICH WILL INCREASE MILL PROFITS.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. IDENTIFY AND EXPLAIN THE DIFFERENT METHODS OF AIR DRYING AND KILN DRYING LUMBER COMMONLY USED IN HIS REGION BY EXPLAINING THE IMPORTANT PRINCIPLES OF EACH METHOD.

2. SORT LUMBER FOR DRYING USING SPECIES, SIZE AND GRADE METHODS WITH ACCURACY WHICH WILL MEET MILL STANDARDS.

3. MAINTAIN THE MECHANICAL SORTING EQUIPMENT COMMONLY FOUND IN AREA MILLS ACCORDING TO THE MANUFACTURER'S SPECIFICATIONS.

4. STACK LUMBER PREPARATORY TO AIR DRYING OR KILN DRYING USING METHODS USED IN AREA MILLS WHICH WILL RESULT IN OPTIMUM DRYING CONDITIONS AND STABLE PILES WITH A MINIMUM AMOUNT OF SHRINKAGE DEFECTS.

5. USE A PORTABLE ELECTRIC MOISTURE METER TO DETERMINE THE MOISTURE IN LUMBER WITH ACCURACY OF ± 1%.

6. DETERMINE THE DIRECT CAUSE AND REMEDIES OF LUMBER DEFECTS WHICH INCLUDE SHRINKAGE DEFECTS, DISEASES AND INSECT DAMAGE WHICH APPEAR DURING THE AIR DRYING PROCESS.

7. PERFORM MAINTENANCE OPERATIONS ON DRY KILNS ACCORDING TO THE MANUFACTURER'S SPECIFICATIONS.

B. INSTRUCTIONAL AREAS

1. IDENTIFYING THE METHODS OF DRYING LUMBER

   A. IDENTIFYING THE PRINCIPLES OF AIR DRYING

   B. IDENTIFYING AIR DRYING METHODS

   C. IDENTIFYING THE PRINCIPLES OF KILN DRYING

   D. IDENTIFYING KILN DRYING METHODS

2. SORTING LUMBER FOR DRYING

   A. USING AUTOMATED SORTING EQUIPMENT

   B. SORTING BY HAND

      (1) SORTING FOR SPECIES
      (2) SORTING FOR THICKNESS
      (3) SORTING FOR WIDTH
      (4) SORTING FOR LENGTH
      (5) SORTING FOR GRAIN

3. MAINTAINING MECHANICAL SORTING EQUIPMENT SUCH AS CHAINS, CABLES AND BELTS

4. STACKING LUMBER

   A. OPERATING A MECHANICAL STACKER

   B. STACKING LUMBER BY HAND

5. MEASURING THE MOISTURE IN LUMBER

   A. OPERATING AN ELECTRIC MOISTURE METER

   B. READING THE METER

6. IDENTIFYING LUMBER DEFECTS OCCURING DURING DRYING

   A. IDENTIFYING SHRINKAGE DEFECTS

   B. IDENTIFYING DEFECTS CAUSED BY FUNGI SUCH AS STAINS, DECAY AND MOLD

   C. IDENTIFYING DEFECTS CAUSED BY CHEMICAL REACTIONS

   D. IDENTIFYING DEFECTS CAUSED BY INSECTS

7. PREVENTING LUMBER DEFECTS

   A. USING PROPER STACKING, PILING AND PILE PROTECTION

   B. SPRAYING FUNGICIDES FOR DISEASE CONTROL

   C. SPRAYING INSECTICIDES

      (1) OPERATING THE SPRAYER
      (2) MAINTAINING THE SPRAYER

8. MAINTAINING DRY KILNS

   A. IDENTIFYING THE KILN PARTS AND THEIR OPERATING PRINCIPLES

B. MAINTAINING THE STRUCTURE

C. MAINTAINING THE HEATING DEVICES

D. MAINTAINING THE VENTILATING DEVICES

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. VISIT SEVERAL MILLS OF VARYING SIZES IN THE AREA TO OBSERVE THE DIFFERENT METHODS OF DRYING LUMBER

2. OBTAIN DIFFERENT SPECIES, SIZE AND QUALITY BOARDS FOR STUDENTS TO PRACTICE DETERMINING SPECIES, SIZE AND GRADE AS WOULD BE REQUIRED FOR SORTING LUMBER.

3. VISIT A MILL WITH MECHANICAL SORTING EQUIPMENT TO OBSERVE THE PRINCIPLES OF OPERATION AND PARTS NEEDING FREQUENT MAINTENANCE.

4. HAVE AN INDUSTRY REPRESENTATIVE ASSIST THE STUDENTS IN STACKING A PILE OF LUMBER USING VARIOUS STACKING METHODS.

5. PRACTICE USING A PORTABLE MOISTURE METER TO DETERMINE THE MOISTURE CONTENT OF LUMBER.

6. MAKE A DISPLAY OF PIECES OF LUMBER CONTAINING SHRINKAGE, DISEASE AND INSECT DEFECTS CAUSED BY IMPROPER DRYING.

7. VISIT A MILL USING A DRY KILN TO DRY LUMBER TO OBSERVE THE OPERATING PRINCIPLES AND PARTS REQUIRING FREQUENT MAINTENANCE.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE THE STUDENT DIAGRAM AND EXPLAIN A SYSTEM OF PROCESSING GREEN LUMBER FROM THE GREEN CHAIN TO COMPLETION OF DRYING, INCLUDING GRADING, SORTING, STACKING AND DRYING.

2. HAVE THE STUDENTS CLASSIFY SEVERAL BOARDS ACCORDING TO SPECIES, SIZE AND GRADE. HAVE AN INDUSTRY REPRESENTATIVE ASSIST IN EVALUATING THE STUDENTS' WORK, IF NECESSARY.

3. GIVE EACH STUDENT A DIAGRAM OF A COMMON MECHANICAL SORTER AND HAVE THEM LABEL THE PARTS, EXPLAIN THEIR FUNCTION AND INDICATE MAINTENANCE REQUIREMENTS.

4. HAVE THE STUDENTS DIAGRAM DIFFERENT METHODS OF STACKING LUMBER FOR DRYING, INCLUDING BOTH MECHANICAL AND HAND METHODS.

5. HAVE EACH STUDENT TAKE MOISTURE READINGS ON SEVERAL BOARDS USING A PORTABLE MOISTURE METER AND COMPARE THE RESULTS TO THOSE OF AN EXPERIENCED INDUSTRY REPRESENTATIVE.

6. CONDUCT A PRACTICAL EXAMINATION USING SAMPLES OF LUMBER CONTAINING DEFECTS. HAVE THE STUDENTS WRITE THE NAME OF THE DEFECT, ITS PROBABLE CAUSE AND METHODS OF PREVENTING IT.

7. USING A DIAGRAM OF A DRY KILN, HAVE THE STUDENTS INDICATE THE IMPORTANT PARTS AND THEIR FUNCTIONS AND THE PARTS REQUIRING FREQUENT MAINTENANCE.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. BOARDS OF VARYING SIZES AND GRADES

2. PORTABLE MOISTURE METER

F. EXAMPLES OF SUPPORTING REFERENCES

1. AIR DRYING OF LUMBER. AGRICULTURE HANDBOOK NO. 402. WASHINGTON, D.C.: U.S. FOREST SERVICE, U.S. DEPARTMENT OF AGRICULTURE. 1971, 110 PAGES.

   THIS GUIDE PROVIDES TECHNICAL INFORMATION CONCERNING THE ENTIRE AIR DRYING PROCESS, INCLUDING OBJECTIVES OF THE PROCESS AND THE BASIC INDUSTRY PRACTICES.

2. DRY KILN OPERATOR'S MANUAL. AGRICULTURE HANDBOOK NO. 188. WASHINGTON, D.C.: U.S. FOREST SERVICE, U.S. DEPARTMENT OF AGRICULTURE. 1961, 197 PAGES.

   THIS MANUAL COVERS MOST PRACTICES AND PROCEDURES INVOLVED IN DRY KILN OPERATION.

WOOD PRESERVATION

UNIT CONCEPT: FOR LONGER LIFE, WOOD EXPOSED TO WEATHER OR IN CONTACT WITH THE GROUND SHOULD BE TREATED WITH A PRESERVATIVE TO PREVENT DETERIORATION THROUGH THE ACTION OF INSECTS OR FUNGI.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. IDENTIFY AND EXPLAIN THE ADVANTAGES AND DISADVANTAGES OF PRESERVATIVE OILS AND WATER-BORNE SALTS COMMONLY USED AS WOOD PRESERVATIVES BY INDICATING THE ACTION OF THE PRESERVATIVE ON THE WOOD.

2. IDENTIFY THE DIFFERENT METHODS OF PRESERVING WOOD USING PRESSURE AND NON-PRESSURE TREATMENTS.

3. PREPARE TIMBER FOR TREATMENT WITH A PRESERVATIVE INCLUDING PEELING, SEASONING, CUTTING AND FRAMING, AND INCISING WHICH WILL RESULT IN THE MOST EFFICIENT AND LONG LASTING USE OF THE PRESERVATIVE.

4. OPERATE AND MAINTAIN PRESSURIZED WOOD TREATMENT EQUIPMENT ACCORDING TO THE MANUFACTURER'S SPECIFICATIONS.

5. TREAT TIMBER OR LUMBER USING COMMON NON-PRESSURE PRESERVATIVES AND USING ONE OF THE FOLLOWING METHODS:

   A. SUPERFICIAL APPLICATIONS,

   B. COLD SOAKING,

   C. DOUBLE DIFFUSION, AND

   D. HOT-COLD BATH.

B. INSTRUCTIONAL AREAS

1. IDENTIFYING WOOD PRESERVATIVES AND THEIR CHARACTERISTICS

   A. IDENTIFYING PRESERVATIVE OILS

   B. IDENTIFYING WATER-BORNE SALTS

2. IDENTIFYING METHODS OF PRESERVING WOOD

A. IDENTIFYING METHODS OF PRESSURE TREATMENT

(1) IDENTIFYING THE TYPES OF EQUIPMENT USED
(2) IDENTIFYING PRINCIPLES OF EQUIPMENT OPERATION

B. IDENTIFYING NON-PRESSURE TREATING PROCESSES

(1) IDENTIFYING THE TYPES OF EQUIPMENT USED
(2) IDENTIFYING THE PRINCIPLES OF THE PROCESSES

3. PREPARING TIMBER FOR TREATMENT

A. PEELING

B. SEASONING THE TIMBER

C. CUTTING AND FRAMING TIMBERS

D. INCISING HARD-TO-TREAT WOOD

4. OPERATING PRESSURE TREATMENT EQUIPMENT

A. PLACING THE WOOD IN THE CYLINDER

B. SUPPLYING THE PRESERVATIVE

C. MAINTAINING PRESSURE OR VACUUM

D. OBSERVING SAFETY PRECAUTIONS

5. MAINTAINING PRESSURE TREATMENT EQUIPMENT

A. IDENTIFYING PARTS AND THEIR FUNCTIONS

B. MAINTAINING STRUCTURAL FEATURES

C. MAINTAINING OPERATING PARTS

6. TREATING WOOD BY NON-PRESSURE METHODS

A. MAKING SUPERFICIAL APPLICATIONS BY BRUSHING, SPRAYING AND DIPPING

B. USING THE COLD SOAKING METHOD

C. USING THE DOUBLE DIFFUSION PROCESS

D. USING HOT-COLD BATH TREATMENTS

E. IDENTIFYING SAFETY PRECAUTIONS

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. DEMONSTRATE THE ACTION OF DIFFERENT PRESERVATIVES ON SAMPLES OF WOOD BY PLACING THE WOOD SAMPLE IN THE PRESERVATIVE FOR A SPECIFIED PERIOD OF TIME AND OBSERVE OR TEST SUCH PROPERTIES AS OILINESS, FLAMMABILITY AND PENETRATION.

2. VISIT SEVERAL MILLS USING VARIOUS METHODS TO PRESERVE WOOD TO OBSERVE THE PROCESSES AND THE RESULTING PRODUCT FROM EACH PROCESS.

3. HAVE THE STUDENTS CUT, PEEL, SEASON AND TREAT FENCE POSTS FOR HOME USE OR FOR SALE AS A GROUP PROJECT.

4. TAKE A FIELD TRIP TO A MILL USING PRESSURE WOOD TREATMENT AND HAVE AN INDUSTRY REPRESENTATIVE HELP THE STUDENTS IN IDENTIFYING PARTS OF THE EQUIPMENT AND THEIR PRINCIPLES OF OPERATION. MAINTENANCE REQUIREMENTS SHOULD ALSO BE INDICATED.

5. HAVE THE STUDENTS PREPARE A DEMONSTRATION OF EACH METHOD OF NON-PRESSURE TREATING OF WOOD USING THE CORRECT PRESERVATIVES AND SAMPLES OF WOOD.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. DEVELOP A MATCHING TEST WHICH WOULD INCLUDE THE PRESERVATIVES, THEIR BASE AND THE EXPECTED ACTION ON WOOD.

2. HAVE THE STUDENTS LIST THE DIFFERENT METHODS OF PRESERVING WOOD.

3. HAVE EACH STUDENT LIST THE STEPS IN PREPARING TIMBER FOR TREATMENT WITH A PRESERVATIVE.

4. GIVE THE STUDENTS A DIAGRAM OF A PRESSURE TREATMENT SYSTEM. HAVE EACH STUDENT IDENTIFY THE MAJOR PARTS AND THEIR FUNCTIONS AND INDICATE AREAS NEEDING FREQUENT MAINTENANCE.

5. HAVE THE STUDENTS INDICATE ON A MATCHING TEST THE NON-PRESSURE METHODS OF PRESERVING WOOD AND THE PRESERVATIVES THAT WOULD BE USED IN EACH METHOD.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. SAMPLES OF COMMON TYPES OF PRESERVATIVES

2. GREEN AND SEASONED SAMPLES OF WOOD

F. EXAMPLES OF SUPPORTING REFERENCES

1. ANDERSON, DAVID A. AND SMITH, WILLIAM H. FORESTS AND FORESTRY. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1970, 357 PAGES.

   THIS TEXT COVERS THE BASIC ASPECTS OF WOOD PRESERVATION.

2. HARVESTING FORESTRY PRODUCTS. KIRBYVILLE, TEXAS: VOCATIONAL INSTRUCTIONAL SERVICES, TEXAS STATE DEPARTMENT OF EDUCATION. 1971, 200 PAGES.

   THE UNIT COVERING FOREST PRODUCTS UTILIZATION IN THIS GUIDE PROVIDES INFORMATION AND TRANSPARENCIES CONCERNING WOOD PRESERVATION.

SCALING AND GRADING LUMBER

UNIT CONCEPT: DEVELOPMENT OF NECESSARY SKILLS AND TECHNIQUES FOR GRADING LUMBER PROVIDES THE BUYER AND SELLER WITH A "YARDSTICK" FOR MEASURING QUALITY AND ENABLES THE PURCHASER TO BUY THE GRADE OR GRADES WHICH BEST SUIT(S) HIS NEEDS. LUMBER GRADES ALSO SERVE AS A BASIS FOR ESTABLISHING LUMBER PRICES.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN EXAMPLES OF HARDWOOD LUMBER, ACCURATELY MEASURE THE NUMBER OF BOARD FEET IN EACH BOARD WITH A SCALE STICK AND GRADE THE LUMBER ACCORDING TO STANDARD HARDWOOD LUMBER GRADES.

2. WHEN GIVEN EXAMPLES OF SOFTWOOD LUMBER, ACCURATELY MEASURE THE NUMBER OF BOARD FEET IN EACH BOARD WITH A SCALE STICK AND GRADE THE LUMBER ACCORDING TO STANDARD SOFTWOOD LUMBER GRADES.

B. INSTRUCTIONAL AREAS

1. IDENTIFYING HARDWOOD LUMBER SPECIES
   - A. USING COLOR CHARACTERISTICS
   - B. USING GRAIN CHARACTERISTICS
   - C. OTHER
2. SCALING HARDWOOD LUMBER
   - A. DETERMINING THE DIMENSIONS OF THE BOARD
     - (1) LENGTH
     - (2) WIDTH
     - (3) THICKNESS
   - B. CALCULATING THE NUMBER OF BOARD FEET
   - C. READING AND CARING FOR A LUMBER SCALE STICK
3. GRADING HARDWOOD LUMBER
   - A. IDENTIFYING HARDWOOD LUMBER DEFECTS

B. IDENTIFYING THE POOR FACE OF THE BOARD

C. IDENTIFYING TYPES OF CUTTINGS

(1) CLEAR FACE
(2) SOUND

D. DETERMINING THE SURFACE MEASURE

E. DETERMINING THE TOTAL NUMBER OF UNITS IN THE BOARD

F. ESTIMATING THE GRADE OF THE BOARD

G. IDENTIFYING THE NUMBER AND SIZE LIMITS OF CUTTINGS IN THE ESTIMATED GRADE

H. DETERMINING THE NUMBER OF CLEAR FACE UNITS REQUIRED FOR THE ESTIMATED GRADE

I. CALCULATING THE NUMBER OF UNITS IN THE CLEAR FACE CUTTINGS

J. DETERMINING THE ACTUAL GRADE OF THE BOARD

K. COMPLETING THE LUMBER TALLY CARD

4. IDENTIFYING SOFTWOOD LUMBER SPECIES

5. SCALING SOFTWOOD LUMBER

6. GRADING SOFTWOOD LUMBER

A. IDENTIFYING SOFTWOOD LUMBER DEFECTS

B. IDENTIFYING THE BETTER FACE OF THE BOARD BY THE DEFECT METHOD

C. CLASSIFYING SOFTWOOD LUMBER

(1) YARD LUMBER
(2) STRUCTURAL LUMBER, TIMBERS AND DIMENSION
(3) FACTORY AND SHOP LUMBER

D. IDENTIFYING SOFTWOOD LUMBER GRADES AND THE REQUIREMENTS FOR EACH

E. DETERMINING THE ACTUAL GRADES OF SOFTWOOD BOARDS

F. RECORDING INFORMATION ON THE LUMBER TALLY CARD

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. HAVE ON HAND SAMPLES OF HARDWOOD AND SOFTWOOD LUMBER FOR EACH STUDENT TO GRADE. IT MAY BE ADVISABLE TO HAVE AN OFFICIAL LUMBER GRADER ASSIST THE STUDENTS IN LEARNING TO GRADE EACH TYPE OF LUMBER.

   B. HAVE STUDENTS GRADE SEVERAL HARDWOOD BOARDS AND EXPLAIN THEIR GRADING.

2. HAVE STUDENTS GRADE SEVERAL SOFTWOOD BOARDS AND EXPLAIN THEIR GRADING.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. GIVEN COMMONLY USED HARDWOOD LUMBER, HAVE THE STUDENTS SCALE AND GRADE THE BOARDS ACCORDING TO STANDARD HARDWOOD LUMBER GRADES WITH ACCURACY TO BE WITHIN MILL STANDARDS.

2. GIVEN COMMONLY USED SOFTWOOD LUMBER, HAVE THE STUDENTS SCALE AND GRADE THE BOARDS ACCORDING TO STANDARD SOFTWOOD LUMBER GRADES WITH ACCURACY TO BE WITHIN MILL STANDARDS.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. HARDWOOD AND SOFTWOOD LUMBER

2. SCALE STICK

3. LUMBER TALLY CARDS

F. EXAMPLES OF SUPPORTING REFERENCES

1. FORESTRY IN AGRICULTURAL EDUCATION IN VIRGINIA. RICHMOND, VIRGINIA: AGRICULTURAL EDUCATION SERVICE, STATE DEPARTMENT OF EDUCATION. 1970, 119 PAGES.

   UNIT XI OF THIS TEACHER'S MANUAL PROVIDES GUIDELINES AND ACTIVITIES TO USE WHEN TEACHING HARDWOOD AND SOFTWOOD LUMBER GRADING.

2. SMITH, WALTON R. SIMPLIFIED GUIDELINES TO - HARDWOOD LUMBER GRADING. ASHEVILLE, NORTH CAROLINA: U.S. FOREST SERVICE, U.S. DEPARTMENT OF AGRICULTURE. 1967, 26 PAGES.

AN EXCELLENT TEACHER AND STUDENT GUIDE FOR HARDWOOD LUMBER GRADING, THIS GUIDE PROVIDES A STEP-BY-STEP ACCOUNT OF THE GRADING PROCESS WITH DIAGRAMS OF BOARDS THAT MAY BE USED FOR PRACTICE OR EVALUATION.

VI

CHRISTMAS TREE PRODUCTION
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CHRISTMAS TREE PRODUCTION

CHRISTMAS TREE PRODUCTION

UNIT CONCEPT: THE ANNUAL DEMAND FOR CHRISTMAS TREES HAS CREATED MUCH INTEREST IN THEM AS A PRIMARY OR SECONDARY FORESTRY ENTERPRISE. COMPETENT SITE SELECTION, PLANTING, CULTURE, HARVESTING AND MARKETING WILL RESULT IN PRODUCTION OF HIGHER QUALITY TREES AND OFTEN HIGHER NET RETURNS FROM THE ENTERPRISE.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. EVALUATE THE MARKET POTENTIAL AND ECONOMICS OF CHRISTMAS TREE PRODUCTION IN HIS AREA.

2. SELECT APPROPRIATE SITES FOR CHRISTMAS TREE PRODUCTION CONSIDERING SOIL REQUIREMENTS, TOPOGRAPHY AND PREPARATION REQUIREMENTS.

3. LAY OUT A CHRISTMAS TREE PLANTATION IN A MANNER WHICH WILL FACILITATE MANAGEMENT.

4. IDENTIFY THE DIFFERENT SPECIES OF CHRISTMAS TREES IN HIS REGION AND INDICATE THEIR CHARACTERISTICS AND MARKET POTENTIAL.

5. USING NEEDED SITE PREPARATION AND PLANTING TOOLS AND EQUIPMENT, PREPARE A SITE AND PLANT CHRISTMAS TREE SEEDLINGS WITH AN ACCEPTABLE SURVIVAL RATE FOR HIS AREA.

6. DEVELOP AND IMPLEMENT A CULTURAL PLAN FOR A CHRISTMAS TREE PLANTATION WHICH WILL RESULT IN VIGOROUS, WELL-FORMED TREES.

7. DEVELOP AND IMPLEMENT A PROTECTION PLAN FOR A CHRISTMAS TREE PLANTATION TO INCLUDE FIRE PROTECTION, PROTECTION FROM INSECTS AND DISEASES AND PROTECTION FROM ANIMALS.

8. DEVELOP AND IMPLEMENT A HARVESTING PLAN FOR A CHRISTMAS TREE PLANTATION INCLUDING TIMING, EQUIPMENT AND STORAGE.

9. DEVELOP AND IMPLEMENT A MARKETING PLAN FOR A CHRISTMAS TREE ENTERPRISE INCLUDING DEVELOPING OUTLETS, MAKING SALES CONTACTS AND GRADING.

B. INSTRUCTIONAL AREAS

1. EVALUATING THE MARKET POTENTIAL AND ECONOMICS

   A. LOCATING MARKETS

   B. DEVELOPING A BUDGET

      (1) ESTIMATING COSTS
      (2) ESTIMATING RETURNS
      (3) DETERMINING GROSS AND NET RETURNS
      (4) DETERMINING POTENTIAL INCOME/ACRE/YEAR

2. SELECTING SITES FOR CHRISTMAS TREE PRODUCTION

   A. DETERMINING SOIL REQUIREMENTS

   B. DETERMINING ACCEPTABLE TOPOGRAPHY

   C. IDENTIFYING DRAINAGE REQUIREMENTS

3. LAYING OUT THE PLANTATION

   A. DEVELOPING ACCESSIBILITY BY MAKING ROADS AND LANES

   B. DETERMINING ROW AND TREE SPACING

   C. SELECTING THE DIRECTION OF ROWS

   D. PREVENTING TREE BORDER SHADING

4. SELECTING TREE SPECIES

   A. DETERMINING CHARACTERISTICS OF DESIRABLE TREES

   B. DETERMINING MARKET PREFERENCES

   C. IDENTIFYING CHRISTMAS TREES

5. PLANTING TREES

   A. PROVIDING NEEDED SITE PREPARATION

      (1) USING HEAVY EQUIPMENT
      (2) USING HAND TOOLS
      (3) USING CHEMICALS

   B. OBTAINING AND SELECTING PLANTING STOCK

   C. CARING FOR PLANTING STOCK

   D. PLANTING METHODS

(1) USING HAND METHODS
(2) USING PLANTING MACHINES

6. IMPLEMENTING A CULTURAL PLAN FOR CHRISTMAS TREES

A. CONTROLLING COMPETING VEGETATION

(1) OPERATING TOOLS AND EQUIPMENT
(2) MAINTAINING TOOLS AND EQUIPMENT
(3) SELECTING CHEMICALS
(4) FORMULATING CHEMICALS
(5) APPLYING CHEMICALS
(6) USING DOMESTIC ANIMALS
(7) TIMING CONTROL METHODS

B. DETERMINING CULTURAL NEEDS

(1) SHEARING TREES

(A) TIMING
(B) SHEARING TECHNIQUES
(C) OPERATING SHEARING TOOLS
(D) MAINTAINING SHEARING TOOLS
(E) DEBUDDING TREES

(2) USING COLORANT SPRAYS

(A) SELECTING SPRAYS
(B) TIMING APPLICATIONS

7. PROTECTING THE TREE PLANTATION

A. DEVELOPING FIRE PROTECTION AND FIRE SUPPRESSION PROCEDURES

(1) SELECTING SUPPRESSION EQUIPMENT
(2) SAFELY OPERATING SUPPRESSION EQUIPMENT
(3) MAINTAINING SUPPRESSION EQUIPMENT

B. DEVELOPING THE INSECT PREVENTION AND CONTROL PROGRAM

(1) IDENTIFYING INSECT PESTS AND THEIR DAMAGE
(2) USING MECHANICAL CONTROL METHODS
(3) USING CHEMICAL CONTROL METHODS

(A) SELECTING CHEMICALS
(B) FORMULATING CHEMICALS
(C) APPLYING CHEMICALS

C. DEVELOPING THE DISEASE PREVENTION AND CONTROL PROGRAM

(1) IDENTIFYING DISEASE SYMPTOMS
(2) USING MECHANICAL CONTROL METHODS
(3) USING CHEMICAL CONTROL METHODS

D. CONTROLLING DAMAGE FROM DOMESTIC AND WILD ANIMALS

8. HARVESTING

A. TIMING

B. SELECTING EQUIPMENT

C. OPERATING EQUIPMENT

D. MAINTAINING EQUIPMENT

E. ORGANIZING THE CREW

F. TYING OR BALING TREES

9. MARKETING CHRISTMAS TREES

A. SELECTING OUTLETS

B. GRADING AND LABELING TREES

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. DEVELOP A BUDGET FOR A CHRISTMAS TREE ENTERPRISE ON A DESIGNATED SITE AFTER OBTAINING COST/RETURN DATA FROM SUCCESSFUL ENTERPRISES.

2. TAKE FIELD TRIPS TO POTENTIAL PLANTATION SITES AND EVAULATE THEM.

3. A. HAVE SUCCESSFUL CHRISTMAS TREE ENTERPRISE OPERATORS AS RESOURCE PERSONS TO DISCUSS METHODS OF LAYING OUT A PLANTATION TO FACILITATE MANAGEMENT.

   B. FOR A GIVEN SITE, DEVELOP A PLANTATION LAYOUT CONSIDERING ACCESSIBILITY, SPACING, ROW DIRECTION AND SHADING.

4. TAKE FIELD TRIPS FOR CONIFER IDENTIFICATION.

5. A. VISIT A NURSERY TO OBSERVE PLANTING STOCK PRODUCTION AND SEEDLING CHARACTERISTICS.

   B. SELECT A SITE, PLANT AND MANAGE A SMALL NUMBER OF CHRISTMAS TREES FOR PERSONAL USE.

6. SELECT CHEMICALS AND DETERMINE FORMULATIONS FOR A GIVEN INSECT OR DISEASE PROBLEM AND SITUATION.

7. HAVE THE STUDENTS DEVELOP AN EXHIBIT OR BULLETIN BOARD DISPLAY OF SPECIMENS OR PICTURES OF IMPORTANT CHRISTMAS TREE DAMAGING INSECTS.

8. ASSIST A CHRISTMAS TREE ENTERPRISE OPERATOR IN HARVESTING HIS TREES.

9. TAKE A FIELD TRIP TO A CHRISTMAS TREE PLANTATION AND HAVE THE OWNER OR AN EMPLOYEE INDICATE EXAMPLES OF EACH GRADE OF TREE.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE EACH STUDENT MAKE A BUDGET FOR A CHRISTMAS TREE ENTERPRISE ON A GIVEN SITE.

2. HAVE EACH STUDENT DETERMINE THE FEASIBILITY OF A DESIGNATED SITE FOR A CHRISTMAS TREE PLANTATION BY DETERMINING SOIL CHARACTERISTICS, TOPOGRAPHY AND ANY OTHER PERTINENT DATA.

3. HAVE EACH STUDENT LAY OUT A CHRISTMAS TREE PLANTATION ON A DESIGNATED SITE. THE PLANS SHOULD CONSIDER ALL PERTINENT FACTORS ABOUT THE SITE AND PROMOTE EASE OF MANAGEMENT.

4. DEVELOP A PRACTICAL EXAMINATION USING BRANCHES, PICTURES OR LIVE SPECIMENS IN WHICH THE STUDENT MUST IDENTIFY THE DIFFERENT SPECIES OF CHRISTMAS TREES IMPORTANT TO HIS AREA.

5. HAVE EACH STUDENT PLANT 100 CHRISTMAS TREES. EVALUATE EACH STUDENT ON HIS ABILITY TO CORRECTLY PLANT THE TREES.

6. HAVE EACH STUDENT SHEAR A CHRISTMAS TREE FOR EVALUATION AS TO CORRECTNESS OF PROCEDURE AND OBSERVANCE OF SAFETY PRACTICES.

7. HAVE THE STUDENTS IDENTIFY SPECIMENS OF CHRISTMAS TREE INSECTS, INDICATE THE DAMAGE CAUSED TO TREES, AND RECOMMEND AN APPROPRIATE CONTROL PROGRAM FOR EACH.

8. HAVE EACH STUDENT DEMONSTRATE HIS ABILITY TO CUT, TRIM AND BALE A CHRISTMAS TREE.

9. DEVELOP A PRACTICAL EXAMINATION IN WHICH THE STUDENT WILL GRADE 10-15 CHRISTMAS TREES USING U.S. STANDARD CHRISTMAS TREE GRADES.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. HARD HATS
2. SHEARING KNIVES AND LEG PROTECTORS
3. CHEMICAL SPRAYERS
4. FIRE FIGHTING EQUIPMENT
5. AXE
6. BOW SAW
7. TREE PLANTING BARS

F. EXAMPLES OF SUPPORTING REFERENCES

1. CHRISTMAS TREE CULTURE IN KENTUCKY. BULLETIN NO. 346. LEXINGTON, KENTUCKY: AGRICULTURAL EXPERIMENT STATION, UNIVERSITY OF KENTUCKY. 1967, 38 PAGES.

   THIS BULLETIN CONTAINS A COMPLETE DESCRIPTION OF THE CHRISTMAS TREE INDUSTRY FROM SITE SELECTION TO MARKETING.

APPENDIX A

Recommended Materials or Equipment

THIS LIST OF EQUIPMENT CAN BE USED AS A GUIDE IN ORDERING AND ASSEMBLING THOSE ITEMS NEEDED. MANY STATE DEPARTMENTS HAVE MORE DEFINITIVE LISTS AVAILABLE AND IT MAY BE WELL TO REQUEST THESE AS ADDITIONAL SOURCES OF INFORMATION. IN ADDITION, EXPERIENCE CAN BE AN IMPORTANT FACTOR IN DEVELOPING LISTS.

FORESTRY LAND LABORATORY EQUIPMENT

CHAIN SAWS
AXES
FALLING WEDGES
CANT DOGS
FILE HOLDERS
RAKER GAUGES
CHAIN BREAKER
RIVET SPINNER
SAW CHAIN VISES
2 1/2 GALLON FUEL CANS
5 GALLON FUEL CANS (DIESEL FUEL)
DIAMETER TAPES
CLIPBOARDS
HAND COMPASSES
STAFF COMPASSES WITH JACOB STAFF
CANT HOOKS
PEAVIES
GUNTER'S CHAINS
HAND PRUNING SAWS
HAND PRUNING SHEARS
POLE PRUNING SAWS
BOW SAWS
LUMBER MOISTURE METER
LOPPING SHEARS
SHOVELS
SPADES
RAKES
GRUB HOES
FIRE RAKES
GREASE GUNS
INSECT NET
PULASKI TOOLS
BACK PACK FIRE PUMPS
GARDEN SPRAYERS
ONE GALLON MEASURES
SMALL SAWMILL WITH ACCESSORIES

TREE INJECTOR
BUS WITH BUILT-IN EQUIPMENT RACKS
SCALE STICKS
CRUISER STICKS
ABNEY LEVELS
SKIDDER COMPLETE WITH WHEEL CHAINS
BULLDOZER WITH WINCH AND CANOPY
TRUCK WITH HYDRAULIC LOG LOADER
DISC-TYPE HARROW
SHEARING KNIVES
NELS-SPOT PAINT GUNS
HATCHETS
FIRST AID KITS
SNAKE BITE KITS
BULLHORN
DRAWING BOARDS
T-SQUARES
PLASTIC DRAFTING TRIANGLES
POCKET STEREOSCOPES
STEREO PAIRS
AERIAL PHOTO INTERPRETATION GRIDS
GRAPHIC SCALES
DRAWING PENS WITH VARIOUS TIPS
DRAWING STENCILS
DRINKING WATER CONTAINER
TOPOGRAPHIC MAPS (15' X 7 1/2')
DRAWING SETS
TALLY METERS
TALLY BOOKS
INCREMENT BORERS
PULPHOOKS
POCKET MAGNIFIERS 14X
V-BELT TENSION TESTER
CHAINING PIN SETS
FLUORESCENT ORANGE BELTS OR VESTS
TRANSIT AND ROD
TREEPLANTING BARS
100-FOOT SURVEYOR'S TAPE
TREE BAGS

SUGGESTED MECHANICS LABORATORY EQUIPMENT

ASSORTED FILES
SOCKET SETS 1/4" DRIVE
SOCKET SET 3/8" DRIVE
SOCKET SET 1/2" DRIVE
SOCKET SET 3/4" DRIVE
HAND SAWS
TABLE SAW
PORTABLE CIRCULAR SAW

ASSORTED SCREW DRIVERS
WRENCH SETS (OPEN-BOX END, 1/4" - 1 1/2")
WRENCH SETS ADJUSTABLE (4" TO 12")
WRENCH SET STILLSON (4" TO 12")
PLIERS, ASSORTED (NEEDLE NOSE, WATER PUMP)
HAMMERS, BALLPEEN 12 OZ.
SLEDGE HAMMERS, 6-8 LBS.
CLAW HAMMERS
WRENCH SETS, ALLEN
TAPE RULES, 10 FT.
HAMMERS, CROSSPEENS, 3 LBS.
HAMMERS, SOFT FACE, 8 OZ.
ENGINE IGNITION FILE
HYDROMETER
SOLDER GUN
OXY-ACETYLENE WELDING OUTFIT, WITH SAFETY EQUIPMENT
ARC WELDING OUTFIT, WITH SAFETY EQUIPMENT
VISEGRIP PLIERS
DIAGONAL PLIERS
HEX KEY WRENCH SET
TOOL BOXES
DRILL PRESS AND DRILL SET
BENCH GRINDER
GRINDSTONE, ELECTRIC DRIVE
3/8" ELECTRIC DRILL AND DRILL SET
1/2" ELECTRIC DRILL AND SET
AIR COMPRESSOR
CHISELS AND PUNCH SETS
MACHINIST VISES
CROW BARS
TAP AND DIE SET
ANVIL
EASY-OUT SET

PERSONAL SAFETY EQUIPMENT

HELMET WITH VISOR, STUDENT TO PURCHASE
SAFETY BOOTS, STUDENT TO PURCHASE
GLOVES (SAFETY)
SHIN GUARDS
GOGGLES
GAS MASK

APPENDIX B

Suggested References for Instructional Units

AIR DRYING OF LUMBER. AGRICULTURE HANDBOOK NO. 402. WASHINGTON, D.C.: U.S. FOREST SERVICE, U.S. DEPARTMENT OF AGRICULTURE. 1971, 110 PAGES.

ALLEN, SHIRLEY W. AND SHARPE, GRANT W. AN INTRODUCTION TO AMERICAN FORESTRY. NEW YORK, NEW YORK: MC GRAW-HILL BOOK COMPANY. 1960, 466 PAGES.

ANDERSON, DAVID A. AND SMITH, WILLIAM A. FORESTS AND FORESTRY. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1970, 357 PAGES.

ANDERSON, R. F. FOREST AND SHADE TREE ENTOMOLOGY. NEW YORK, NEW YORK: JOHN WILEY AND SONS, INC. 1960.

AVERY, EUGENE T. INTERPRETATION OF AERIAL PHOTOGRAPHS. MINNEAPOLIS, MINNESOTA: BURGESS PUBLISHING COMPANY. 1968, 324 PAGES.

BENDER, RALPH E. THE FFA AND YOU. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1962, 494 PAGES.

BINKLEY, HAROLD AND HAMMONDS, CARSIE. EXPERIENCE PROGRAMS FOR LEARNING VOCATIONS IN AGRICULTURE. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1970, 604 PAGES.

BROMLEY, W. S. PULPWOOD PRODUCTION. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1969, 259 PAGES.

BROWN, ARTHUR A. AND DAVIS, KENNETH P. FOREST FIRE: CONTROL AND USE. NEW YORK, NEW YORK: MC GRAW-HILL BOOK COMPANY. 1973, 686 PAGES.

CAREERS IN THE LOGGING INDUSTRY. SALEM, OREGON: DEPARTMENT OF HUMAN RESOURCES, STATE OF OREGON EMPLOYMENT DIVISION. 1971, 30 PAGES.

CHAIN SAW SERVICE MANUAL. KANSAS CITY, MISSOURI: TECHNICAL PUBLICATIONS DIVISION, INTERTEC PUBLISHING CORPORATION. 1970, 240 PAGES.

CHRISTMAS TREE CULTURE IN KENTUCKY. BULLETIN NO. 346. LEXINGTON, KENTUCKY: AGRICULTURAL EXPERIMENT STATION, UNIVERSITY OF KENTUCKY. 1967, 38 PAGES.

COLLINS, HENRY HILL, JR. COMPLETE FIELD GUIDE TO AMERICAN WILDLIFE. NEW YORK, NEW YORK: HARPER AND ROWE PUBLISHERS, INC. 1959, 683 PAGES.

CONSERVATION AIDE IV - SURVEYING. COLUMBUS, OHIO: OHIO AGRICULTURAL EDUCATION CURRICULUM MATERIALS SERVICE, THE OHIO STATE UNIVERSITY. 1972, 83 PAGES.

CONWAY, STEVE. TIMBER CUTTING PRACTICES. SAN FRANCISCO, CALIFORNIA: MILLER FREEMAN PUBLISHERS, INC. 1973, 192 PAGES.

COURSE OF STUDY IN AGRICULTURAL OCCUPATIONS. LEXINGTON, KENTUCKY: DEPARTMENT OF AGRICULTURAL EDUCATION, UNIVERSITY OF KENTUCKY. 1967, 262 PAGES.

DEAN, F. W., CHADWICK, L. C. AND COWEN, W. F. OHIO TREES. CURRENT EDITION. COLUMBUS, OHIO: THE UNIVERSITY BOOKSTORE, THE OHIO STATE UNIVERSITY. 127 PAGES.

DRY KILN OPERATOR'S MANUAL. AGRICULTURAL HANDBOOK NO. 188. WASHINGTON, D.C.: U.S. FOREST SERVICE, U.S. DEPARTMENT OF AGRICULTURE. 1961, 197 PAGES.

FIREMAN'S HANDBOOK. WASHINGTON, D.C.: U.S. DEPARTMENT OF AGRICULTURE, U.S. GOVERNMENT PRINTING OFFICE. 1971, 61 PAGES.

FIRST AID TEXTBOOK. WASHINGTON, D.C.: THE AMERICAN NATIONAL RED CROSS. 1957, 249 PAGES.

FORESTER'S GUIDE TO AERIAL PHOTO INTERPRETATION. AGRICULTURAL HANDBOOK 308. WASHINGTON, D.C.: U.S. FOREST SERVICE, U.S. DEPARTMENT OF AGRICULTURE. 1966, 41 PAGES.

FORESTRY IN AGRICULTURAL EDUCATION IN VIRGINIA. RICHMOND, VIRGINIA: AGRICULTURAL EDUCATION SERVICE, STATE DEPARTMENT OF EDUCATION. 1970, 119 PAGES.

GRADE DEFECTS IN HARDWOOD TIMBER AND LOGS. WASHINGTON, D.C.: U.S. DEPARTMENT OF AGRICULTURE, U.S. GOVERNMENT PRINTING OFFICE. 1969, 39 PAGES.

A GUIDE TO HARDWOOD LOG GRADING. UPPER DARBY, PENNSYLVANIA: U.S. FOREST SERVICE, U.S. DEPARTMENT OF AGRICULTURE. 1965.

HARVESTING FORESTRY PRODUCTS. KIRBYVILLE, TEXAS: VOCATIONAL INSTRUCTIONAL SERVICES, TEXAS STATE DEPARTMENT OF EDUCATION. 1971, 200 PAGES.

HUMAN RELATIONS IN BUSINESS. COLUMBUS, OHIO: OHIO AGRICULTURAL EDUCATION CURRICULUM MATERIALS SERVICE, THE OHIO STATE UNIVERSITY. 1971, 70 PAGES.

A JOB WITH THE FOREST SERVICE. PUBLICATION NO. 843. WASHINGTON, D.C.: U.S. FOREST SERVICE, U.S. DEPARTMENT OF AGRICULTURE. 1972, 20 PAGES.

LUNSTRUM, STANFORD J. CIRCULAR SAW MILLS AND THEIR EFFICIENT OPERATION. ATLANTA, GEORGIA: U.S. FOREST SERVICE, U.S. DEPARTMENT OF AGRICULTURE. 1972, 86 PAGES.

MANAGEMENT OF FOREST RESOURCES FOR MULTIPLE USE. UNIVERSITY PARK, PENNSYLVANIA: DEPARTMENT OF AGRICULTURAL EDUCATION, THE PENNSYLVANIA STATE UNIVERSITY. 1970, 124 PAGES.

MANAGING THE FAMILY FOREST. BULLETIN NO. F 2187. WASHINGTON, D.C.: U.S. DEPARTMENT OF AGRICULTURE, U.S. GOVERNMENT PRINTING OFFICE. 1962, 61 PAGES.

MEMBERSHIP - THE PATHWAY TO LEADERSHIP. COLUMBUS, OHIO: OHIO AGRICULTURAL EDUCATION CURRICULUM MATERIALS SERVICE, THE OHIO STATE UNIVERSITY. 1962, 23 PAGES.

OFFICIAL MANUAL, FUTURE FARMERS OF AMERICA. ALEXANDRIA, VIRGINIA: FUTURE FARMERS SUPPLY SERVICE. 1972, 128 PAGES.

OPERATING FARM TRACTORS AND MACHINERY, EFFICIENTLY, SAFELY. AMES, IOWA: PUBLICATIONS DISTRIBUTION CENTER, IOWA STATE UNIVERSITY OF SCIENCE AND TECHNOLGOY. 1969, 81 PAGES.

OPERATING THE KNUCKLE-BOOM LOADER. CLEMSON, SOUTH CAROLINA: VOCATIONAL EDUCATION MEDIA CENTER, CLEMSON UNIVERSITY. 1972, 29 PAGES.

OPPORTUNITIES IN AGRICULTURE OCCUPATIONS AND THE EMPLOYEE WITHIN THE BUSINESS ORGANIZATION. COLUMBUS, OHIO: OHIO AGRICULTURAL EDUCATION MATERIALS SERVICE, THE OHIO STATE UNIVERSITY. 1971, 68 PAGES.

PERMANENT LOGGING ROADS FOR BETTER WOODLOT MANAGEMENT. WASHINGTON, D.C.: U.S. FOREST SERVICE, U.S. DEPARTMENT OF AGRICULTURE.

PRODUCTS FROM OUR FORESTS - THEIR MANUFACTURE AND USE - STUDENT RESOURCE UNIT. UNIVERSITY PARK, PENNSYLVANIA: DEPARTMENT OF AGRICULTURAL EDUCATION, THE PENNSYLVANIA STATE UNIVERSITY. 1971, 95 PAGES.

RESOURCE UNIT ON CAREER OPPORTUNITIES FOR CORE CURRICULUM. TUCSON, ARIZONA: DEPARTMENT OF AGRICULTURAL EDUCATION, THE UNIVERSITY OF ARIZONA. 1970, 10 PAGES.

RESOURCE UNIT ON HUMAN RELATIONS. TUCSON, ARIZONA: DEPARTMENT OF AGRICULTURAL EDUCATION, THE UNIVERSITY OF ARIZONA. 1971, 90 PAGES.

SCHWAB, GLENN O., FREVERT, RICHARD K., BARNES, KENNETH K. AND EDMINSTER, TALCOTT W. ELEMENTARY SOIL AND WATER ENGINEERING. NEW YORK, NEW YORK: JOHN WILEY AND SONS, INC. 1965, 296 PAGES.

SMALL ENGINES. VOLUME I. ATHENS, GEORGIA: ENGINEERING CENTER, AMERICAN ASSOCIATION FOR VOCATIONAL INSTRUCTIONAL MATERIALS. 1968, 150 PAGES.

SMITH, WALTON R. SIMPLIFIED GUIDELINES TO - HARDWOOD LUMBER GRADING. ASHEVILLE, NORTH CAROLINA: U.S. FOREST SERVICE, U.S. DEPARTMENT OF AGRICULTURE. 1967, 26 PAGES.

STEWART, W. F. HELPS IN MASTERING PARLIAMENTARY PROCEDURE. COLUMBUS, OHIO: OHIO AGRICULTURAL EDUCATION CURRICULUM MATERIALS SERVICE, THE OHIO STATE UNIVERSITY. 1961, 17 PAGES.

TRACTOR MAINTENANCE. ATHENS, GEORGIA: ENGINEERING CENTER, AMERICAN ASSOCIATION FOR VOCATIONAL INSTRUCTIONAL MATERIALS. 1970, 145 PAGES.

TRACTOR OPERATION AND DAILY CARE. ATHENS, GEORGIA: ENGINEERING CENTER, AMERICAN ASSOCIATION FOR VOCATIONAL INSTRUCTIONAL MATERIALS. 1967, 120 PAGES.

APPENDIX C

Selected List of Professional and Technical Societies and Organizations Concerned with Forestry and its Application

INCLUSION OR OMISSION OF AN ORGANIZATION OR SOCIETY IN THIS LIST DOES NOT IMPLY APPROVAL OR DISAPPROVAL OF IT. ADDITIONAL INFORMATION REGARDING LOCAL CHAPTERS OR SECTIONS OF THESE ORGANIZATIONS OR SOCIETIES MAY BE OBTAINED BY WRITING DIRECTLY TO THE EXECUTIVE SECRETARY AT THE LISTED ADDRESS.

AMERICAN CONGRESS ON SURVEYING AND MAPPING, 733 15TH STREET, N.W., WASHINGTON, D.C. 20005

AMERICAN FORESTRY ASSOCIATION, 919 17TH STREET, N.W., WASHINGTON, D.C. 20006

AMERICAN FOREST PRODUCTS INDUSTRIES, 1816 N. STREET, N.W., WASHINGTON, D.C.

AMERICAN PULPWOOD ASSOCIATION, 605 THIRD AVENUE, NEW YORK, NEW YORK 10016

ASSOCIATION OF CONSULTING FORESTERS, BOX 6, WAKE, VIRGINIA 32176

FOREST FARMERS ASSOCIATION COOPERATIVE, 1100 CRESCENT AVENUE, N.E., BOX 7284, STATION C, ATLANTA, GEORGIA

FOREST PRODUCTS RESEARCH SOCIETY, 417 NORTH WALNUT STREET, MADISON, WISCONSIN 53705

INDUSTRIAL FORESTRY ASSOCIATION, 1410 S.W. MORRISON STREET, PORTLAND, OREGON 97205

NORTHEASTERN LOGGERS ASSOCIATION, INC. OLD FORGE, NEW YORK 13420

SOCIETY OF AMERICAN FORESTERS, SUITE 300, 1010 16TH STREET, 13420

SOIL CONSERVATION SOCIETY OF AMERICA, INC., 8515 N.E. ANKENY ROAD, ANKENY, IOWA 50021

SOUTHERN FOREST INSTITUTE, ONE CORPORATE SQUARE, N.E., SUITE 280, ATLANTA, GOERGIA 30329

SOUTHERN PINE ASSOCIATION, BOX 52468, NEW ORLEANS, LOUISIANA 70100

TECHNICAL ASSOCIATION OF THE PULP AND PAPER INDUSTRY, 360 LEXINGTON AVENUE, NEW YORK, NEW YORK 10017

BEST COPY AVAILABLE

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